Proceedings of the
American Association of Textile Chemists and Colorists

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SEPTEMBER 28, 1953

ADR AWARD PRESENTED TO ROBERT H BLAKER

R H Blaker

THE third annual presentation of the AMERICAN DYESTUFF REPORTER Award was made to Dr Robert H Blaker, a research supervisor in the Jackson Laboratory of E I du Pont de Nemours & Co, Inc, Wilmington, Delaware, for his paper "Principles of Copper Dyeing of Polyacrylonitrile Fibers: The Controlled Redox-Potential Method." This paper was presented on November 7th, 1952 at the National Convention held in Boston and was published in the *Proceedings* on February 2nd, 1953. Judges for the Award were Prof Ethel L Phelps, University of Minnesota, *Chairman;* John N Dalton, Pacific Mills; and Dr Alfred R Macormac, U S Department of Agriculture. The presentation of the Award was made at the Annual Banquet of the 1953 National Convention on September 19th at the Conrad Hilton Hotel in Chicago by Prof Percival Theel, Philadelphia Textile Institute, Chairman of the Association's Publications Committee.

Dr Blaker is a native of West Virginia and was graduated from Berea College in 1942. He also attended Massachusetts Institute of Technology and engaged in rocket research during the war on the West Coast. He later taught chemistry at Berea and received a PhD in physical chemistry from California Institute of Technology in 1949. He spent a year abroad on a grant from the Imperial Chemical Industries of England. He joined the Jackson Laboratory of E I du Pont de Nemours & Co, Inc in 1950 as a research chemist and spent two years on problems associated with the dyeing of synthetic fibers. Currently, Dr Blaker is a research supervisor in the Jackson Laboratory.

The AMERICAN DYESTUFF REPORTER Award was endowed by the Howes Publishing Company as a memorial to Alfred P Howes, Founder of the A D R. Its purpose is to encourage the presentation of the best possible papers before local and national meetings of the Association. The Award, $200 annually, is presented to the author or authors of the paper considered best in the opinion of the judges. Any technical paper presented before a local or national meeting of the AATCC and published in the *Proceedings* as they appear in the AMERICAN DYESTUFF REPORTER is eligible with the following exceptions: Intersectional Contest papers, papers by employees of the AATCC, reports of work substantially subsidized by AATCC, or reports of research committees. It is a condition of eligibility that the paper have its first publication in the *Proceedings.* Papers published in the *Proceedings* from July 1st of one year to June 30th of the next year are considered in each judging period.

The first presentation of the A D R Award was made at the Annual Banquet of the New York National Convention on October 19th, 1951 at the Hotel Statler, New York, to Drs Mason Hayek and Fred C Chromey of the Jackson Laboratory of E I du Pont de Nemours & Co, Inc. The paper chosen was entitled "The Measurement of Static Electricity" and was published in the March 5, 1951 issue. It had been presented before the Auxiliaries and Testing Group Meeting at the Portsmouth National Convention in 1950 by Dr Hayek.

The second presentation of the Award was made at the Annual Banquet of the Boston National Convention on November 8th, 1952 at the Hotel Statler, Boston, to Charles J Lyle, Joseph J Iannarone and Dr Robert J Thomas of the Technical Laboratory, E I du Pont de Nemours & Co, Inc. The paper selected was "High-Temperature Dyeing of New Synthetic Fibers" which was published in the September 17, 1951 issue. The paper was presented by Dr Thomas before the Rhode Island Section in Providence on May 25, 1951.

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Nuessle Slated to Address Washington Section

ALBERT C Nuessle, head of the Textile Applications Laboratory of the Rohm & Haas Company, will speak on "Chemical Finishing of Textiles" at the October 2nd meeting of the Washington Section. The meeting will be held in the Cabinet Room of the Willard Hotel, 14th St & Pennsylvania Ave, N W, in Washington, D C.

E J Stephen PNW Section Chairman

EDWARD J STEPHEN, Chairman of the Pacific Northwest Section, died suddenly on Thursday, August 27th. Born in California on November 26, 1909, Mr Stephen spent most of his active career in the woolen business, and at the time of his death was superintendent of the Paris Woolen Mills, Stayton, Oregon. He leaves a widow and two children.

E J Stephen

EMPLOYMENT REGISTER

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Lowell Textile Institute, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the Secretary.

53-20

Education: school, England.

Experience: Head Dyer, USA.

Age: 55; married; references; position as wool or worsted dyer desired, California preferred but not essential.

9-14; 9-28

53-21

Education: BS, textile chemistry.

Experience: chemist, cotton finishing.

Age: 27; veteran; references; position as chemist in textile printing sales service laboratory desired, preferably in southeastern US.

9-14; 9-28

Piedmont Section Officers for '54

THE following slate of officers for 1954 been announced by the Piedmont Section:

Chairman—Henry A Rutherford, School of Textiles, North Carolina State College

Vice Chairman—Henry J Jordan, Jr, Piedmont Processing Company

Secretary—Clarence Hooper, Burlington Mills Corporation

Treasurer—Clement O Stevenson, Ciba Company, Inc

Custodian—Arthur R Thompson, Ciba Company, Inc

Councilors—Joseph Lindsay, Jr, School of Textiles, Clemson Agricultural College; Rapheal E Rupp, Southern Dyestuff Corporation; R Hobart Souther, Cone Mills Corporation; Harley Y Jennings, Dan River Mills; M M McCann, Warwick Chemical Company Division

Sectional Committee—Francis K Burr, Burlington Mills Corporation; Dale W Kern, Riegal Textile Corporation; W E Rixon, Carbide and Carbon Chemicals Corporation; Fred W Sturtevant, Fieldcrest Mills.

CALENDAR

AATCC

COUNCIL
1953—Nov 20.
1954—Jan 27, Apr 30, June 15, Sept 15, Nov 19.
1955—Jan 21, Apr 15, June 17

NATIONAL CONVENTIONS
Sept 15-18, 1954 (Atlanta Biltmore, Atlanta, Ga); Sept 21-23, 1955 (Chalfonte-Haddon Hall, Atlantic City, N J).

NEW YORK SECTION
Oct 23, Nov 20 (Swiss Chalet); Jan 29, Feb 26 (Hotel Statler, N Y); April 23, 1954, May 21, 1954 (Swiss Chalet).

MID-WEST SECTION
November 7, February 13 (Hotel Bismarck, Chicago, Ill.)

NORTHERN NEW ENGLAND SECTION
Nov 6 (LTI); Dec 4 (MIT Faculty House).

PACIFIC SOUTHWEST SECTION
Nov 20, Jan 29.

PIEDMONT SECTION
Jan 30 (Hotel Poinsette, Greenville, S C); Apr 10 (Hotel Roanoke, Roanoke, Va); June 11-12 (Outing, Mayview Manor, Blowing Rock, N C); Sept 11 (Hotel Barringer, Charlotte, N C).

PHILADELPHIA SECTION
Oct 23 (Penn-Sheraton Hotel, Philadelphia, Pa); Dec 4; Jan 15, 1954.

RHODE ISLAND SECTION
Oct 23 (Prov Eng Soc); Dec 4 (Annual Meeting, Sheraton-Biltmore, Providence).

SOUTH CENTRAL SECTION
Dec 5 (Patten Hotel).

WESTERN NEW ENGLAND SECTION
Oct 2, Nov 6 and Dec 11 (Rapp's Restaurant, Shelton, Conn).

OTHER EVENTS

AMERICAN ASSOCIATION OF TEXTILE TECHNOLOGY, INC
Oct 7, Nov 4, Dec 2 (Builder's Club, New York, N Y).

AMERICAN CHEMICAL SOCIETY
National Chemical Exposition—Oct 12-15, 1954, Chicago, Ill.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS
Textile Industry Conference—Oct 29-30, N C State College, Raleigh, N C.

AMERICAN OIL CHEMISTS' SOCIETY
27th Fall Meeting, November 2-4, Sherman Hotel, Chicago, Ill.

AMERICAN SOCIETY FOR QUALITY CONTROL
Meetings of the Carolinas Section—Oct 9, Feb 4-6, N C State College School of Textiles, Raleigh, N C.
Conference of the Carolinas, Georgia, Tennessee, Birmingham and Huntsville Sections—Nov 5-7, Chattanooga, Tenn.

AMERICAN SOCIETY FOR TESTING MATERIALS
1953 Fall Meeting, Oct 14-16, New York, N Y.

AMERICAN TEXTILE MACHINERY ASSOCIATION
Exhibit of American Textile Machinery, April 26-May 1, Atlantic City Exhibition Hall, Atlantic City, N J.

ASSOCIATION OF CONSULTING CHEMISTS AND CHEMICAL ENGINEERS, INC
Annual Meeting—25th Anniversary-October 27 (Hotel Belmont Plaza, New York).

DRYSALTERS CLUB OF NEW ENGLAND
Oct 30, Jan 18, April 30 (Hotel Vendome, Boston); June 25 (Annual Outing, Andover Country Club).

EXPOSITION OF CHEMICAL INDUSTRIES
Nov 30-Dec 5, Commercial Museum and Convention Hall, Philadelphia, Pa.

THE FIBER SOCIETY
Spring Meeting—May 5-6, Monticello Hotel and Thomas Jefferson Inn, Charlottesville, Va.

GARMENT DYERS GUILD OF AMERICA
Technical and business meeting—Dec 5, Netherlands Plaza, Cincinnati, O.

NATIONAL COTTON COUNCIL OF AMERICA
Annual Meeting—Feb 1-2, Atlanta, Ga.
Cotton Research Clinic—Feb 25-27, The Carolina, Pinehurst, N C.

NATIONAL SAFETY CONGRESS AND EXPOSITION
Oct 19-23, Conrad Hilton, Morrison and Hamilton Hotels, Chicago, Ill.

NEW YORK BOARD OF TRADE (DCAT)
28th Annual Dinner, March 4 (Waldorf-Astoria, New York, N Y).

PHI PSI FRATERNITY
51st Annual Convention, Feb 25-27 (The Carolina, Pinehurst, N C).

SCREEN PROCESS PRINTING ASSOCIATION
Screen Process Exhibition under the auspices of the New Jersey Chapter—Sept 14-Oct 3, Newark Public Library.

SOCIETY OF CHEMICAL INDUSTRY
Plastics and Polymers Group Meeting—March 24-26, Institution of Electrical Engineers, Savoy Place, London, England.

SOCIETY OF INDUSTRIAL PACKAGING AND MATERIALS HANDLING ENGINEERS
October 19-24, Mechanics Hall, Boston, Mass.

SOCIETY OF THE PLASTICS INDUSTRY
Meeting of the Sheeting and Coated Fabrics Division—Dec 3-4, Commodore Hotel, New York, N Y.

SOUTHERN TEXTILE EXPOSITION
October 4-9, 1954 (Textile Hall, Greenville, S C).

TEXTILE RESEARCH INSTITUTE
1953 Annual Meeting, Nov 12-13, Commodore Hotel, New York.

TEXTILE TECHNICAL FEDERATION OF CANADA
Exhibit—April, 1955, Show Mart, Montreal.

Membership Applications

September 11, 1953

SENIOR

Edward L Babb—textile chemist and technical sales representative, Reichhold Chemicals Inc, Charlotte, N C. Sponsors: R Gow, E R Roper.

Nicholas M Manfra—dyeing technician and sales, American Standard Fabricators Corp, New York, N Y. Sponsors: M N Manfra, G T Kreis.

ASSOCIATE

Matthew McCorkle—production manager, Marks Polarized Corp, Whitestone, N Y.

APPLICATION FOR TRANSFER TO SENIOR MEMBERSHIP

Robert William Bechard

Charles P Moore, Jr

1952 Annual Convention ——

SYMPOSIUM ON STREAM POLLUTION*

Opening Address by the Presiding Chairman

E A LEONARD†

Textile Industry Representative
National Technical Task Committee on Industrial Wastes

E A Leonard

TO those in the textile industry who have recently been confronted with a problem in stream pollution due to industrial wastes, it is confusing to find that many different authorities and agencies are connected with the subject. Furthermore, it appears that the areas in which these different authorities operate are not clearly delineated or separated. The first act of a person presented with such a problem is usually an attempt to determine sources of information and the agency which has jurisdiction over his given area.

To anyone first digging into a stream-pollution problem a little study makes the situation more confusing rather than less so. He finds that the Federal Government has a law, but that certain states, counties, cities, and interstate commissions also have something to say, and he is faced with a need to find out who has how much to say about his particular problem. Furthermore, many agencies are carrying on or sponsoring research work which can be a valuable source of information and help. The Federal Government, several states, trade associations, and universities are active, and a large job of compilation and sorting is involved to get a specific answer to a specific problem or even to determine whether an answer exists. In spite of what may appear at first to be a confused situation, there is an orderly pattern in the whole program, and it is the purpose of this session to enumerate and explain the activities in stream pollution which are going on today and to show how the AATCC will operate among these many agencies for helping textile-industry members get information to solve their problems.

It is also my great pleasure to announce that national and sectional AATCC Stream-Pollution-Abatement Committees have been established to help the textile wet-processing industry collect necessary and helpful technical information on its waste problems.

Figure 3 shows in simple terms how the AATCC National and Sectional Stream-Pollution Committees will connect the textile industry to the other sources of information available. The Federal Security Agency is responsible for administering the provisions of Public Law 845, the federal law on stream pollution. Within the scope of this law a National Technical Task Committee on Industrial Wastes has been established. The purpose of this committee is the exchange of technical information between the major wet-processing industries and Federal Government. Dr Warrick's address will explain in much greater detail the functions and operations of this committee.

The National AATCC Stream-Pollution Committee will tie in with the National Technical Task Committee both receiving and imparting information and will in turn disseminate data through the sectional committees. This operation will be explained by the Chairman of the National Committee and R Hobart Souther, Chairman of an operating sectional committee.

The sectional committees can tie in with state and local agencies, who are concerned with pollution abatement in their respective areas. These sectional committees are therefore at the service of the textile mills for feeding information. You will hear from the other speakers about the way in which we hope to develop these committees into more functions.

Our theme is this: that today regulatory measures are relatively few and exploratory or tentative in type. Within the coming years regulations on water purity must become more widespread and more stringent. There can be no doubt about it, since it is not a matter of promotion, but a matter of physical necessity. Growing industrialization and growing populations require increasing amounts of potable, recreational, and industrial water supplies. The total supply is not unlimited, as we have learned in recent summers of low rain, and this total amount is reduced by exactly the extent to which it is polluted so as to be unavailable for the purposes mentioned. Because of normal growth and progress, we as a nation will not be able to spare in a few years that part of our water supply which is wasted by pollution. It's as simple as that.

Municipal sewage must also undergo more careful study, and most of the country's municipalities will eventually have to enlarge or modernize their present facilities or set up new ones. The latest estimate which I have seen attributes about 50% of the nation's stream-pollution problem to industrial wastes and the other 50% to municipal wastes.

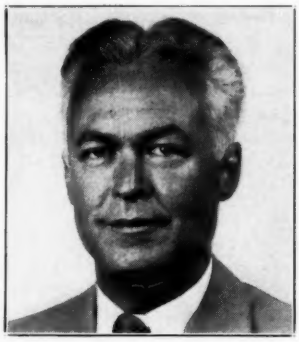
We are presently enjoying a period, however, in which voluntary action is the order of the day. Therefore, we propose that it is time for a thorough technological study of our textile wastes, so that each of us knows what it is possible to do with them, and what it will cost to do it. Then, when action is to be taken, we will be dealing with an explored problem, rather than an unknown, which can always be handled with less panic and at lower cost. The toughest waste problems can be isolated and subjected to research, waste reduction at the source can be carried to its limit; in general, if there is time available for study, the problem itself can be minimized. This session will exemplify some of these approaches and show how the AATCC will take part to assist.

* Held at the Statler Hotel in Boston on November 7, 1952.

† Superintendent, Fiber Preparation Division, Alexander Smith, Inc, Yonkers 1, N Y.

Public Law 845 and Co-operation between Federal Government and Industry

LOUIS F WARRICK
Chief, Technical Services Branch
Division of Water Pollution Control
U S Public Health Service



L F Warrick

The U S Dept of Health, Education and Welfare is responsible for administering the provisions of Public Law 845, the federal law on stream pollution. Within its scope a national technical committee on industrial wastes has been established. The purpose of this committee is the exchange of technical information between the major wet processing industries and Federal Government. Discussed in detail are the functions and operation of this committee.

THERE has been a growing realization in this country during recent years that water supplies of unlimited quantity and satisfactory quality can no longer be taken for granted. People throughout the Nation are beginning to recognize and understand the damaging effects of pollution and are joining in an effort to eliminate and control the threat to the continued use and enjoyment of this most priceless of our natural resources. Cities and industries are showing increasing willingness to accept responsibility for providing measures to preserve and improve water quality by protecting it from the polluting effects of their harmful wastes.

THE FEDERAL WATER POLLUTION CONTROL ACT——In 1948 the first comprehensive Federal legislation for the control of water pollution, Public Law 845 of the 80th Congress, was passed. Appropriations to begin the work authorized were made available a year later. The Federal program, therefore, has now been operating for a little more than three years. Since some of you may not be completely familiar with the provisions of the law, let me outline them briefly.

Originally some of the provisions, principally those relating to financial authorizations, carried a five-year limitation, from June 30, 1948, to June 30, 1953. During this past session of Congress, however, these provisions were extended for an additional three-year period to June 30, 1956.

The Act clearly stated as a policy of the Congress that primary responsibility for the control of water pollution rests with the States. It recognized, however, responsibilities of the Federal Government in this regard, in view of the effects of pollution on public health and on the natural resources of the Nation.

One of the sections of the new law directed the Public Health Service to develop, in co-operation with State and interstate agencies and others, comprehensive programs for eliminating or reducing the pollution of the Nation's water resources. It specified that in the development of such programs due consideration be given to all water uses—public water supply, propagation of fish and aquatic life, recreational purposes, and agricultural, industrial, and other legitimate uses.

The Act authorized Federal financial assistance (1) to the States and interstate agencies in the form of *grants* for investigations and studies relating to industrial wastes; and (2) to municipalities in the form of *loans* for the planning and construction of needed sewage-treatment plants. Although authorized, funds for these planning and construction loans have not been appropriated.

The Act further authorizes Federal research and technical assistance on water-pollution problems, and directs that the Public Health Service collect and disseminate information and make available the results of surveys and investigations. It specifies that co-operative activities between States, uniform State water-pollution legislation, and interstate compacts should be encouraged.

The Act provides that Federal enforcement may be exercised on interstate waters, but only after the efforts of the States concerned have been exhausted, and then only with the consent of the States. Detailed procedures provided for the initiation of enforcement action include formal notifications to the State in which the pollution originates and to the offender, hearings, and finally the instigation of the suit.

The Act directs the establishment of a Water-Pollution Control Advisory Board having six non-Federal members appointed annually by the President and five representatives of the Federal agencies carrying on activities in the water-resources field. The Board's function was defined as being to review policies and programs of the Public Health Service under the Water-Pollution Control Act and to make recommendations to the Surgeon General regarding such policies and programs.

Throughout the Act the principle of primary State responsibility and the importance of co-operation with and assistance to the States is repeatedly stressed. Traditionally, the activities of the Public Health Service have been carried on in this way. In the water-pollution control program, the Service is following its long-established policy of support and assistance to the States. Shortly after the passage of Public Law 845, regional planning conferences were held with representatives of the State water-pollution control authorities. During these conferences tentative plans for carrying out the activities directed by the law were presented and discussed in detail. In setting the program followed during the first three years of operation, the Public Health Service has been guided by the suggestions received at those regional meetings and subsequent consultations with State agencies. A second series of meetings was held last Fall to report progress to the States and to work out with them necessary adjustments in the program in the light of experience to date.

ORGANIZATION

The Division of Water-Pollution Control was established in the Public Health Service to carry out the functions outlined in the Act. This Division comprises a headquarters office in Washington and ten field units. In the headquarters office there are three branches directing the work in the areas of field operations, technical services and reports and education. The Environmental Health Center in Cincinnati carries on the research required by the Division.

FIELD OPERATIONS——The activities in the field are carried on, under the direction of the Field Operations Branch, in ten river-basins offices, each located in one of the major drainage basins of the country. This decentralization permits

close co-operation with the States in accordance with the policy set forth in the Act.

During the first years of operation, efforts in the field have been concentrated principally on gathering together all available water-pollution data to serve as a basis for the development of the comprehensive programs directed by the Congress. Many of the States had a considerable amount of such information in their files, collected during the course of their work on the pollution problem over the years. Additional data were available from interstate and Federal agencies. From these sources it was possible to gather a large body of information, which was assembled according to the 226 individual river basins of the country, integrated, analyzed, interpreted, and published in 15 summary reports on the major drainage areas.

Each report contains a narrative discussion, describing the area as a whole, setting forth the sources and effects of pollution, and stating the conclusions and recommendations resulting from analysis of the data available. Tabulations are included, showing pollution and treatment data for the entire basin. In a second section there are similar discussions and tabulations relating to each of the region's principal subbasins, and lists of treatment plant projects known to be required by the cities and industries of the area. The reports point out that these lists were prepared on the basis of currently available data, which were in many instances incomplete.

The 15 summary drainage-basin reports were completed in early 1952, and since that time the basin offices, in co-operation with the States, have directed their efforts toward supplementing the information, as necessary, to provide a sufficiently complete basis for the development of the comprehensive programs.

REPORTS AND EDUCATION—— It is the responsibility of the Reports and Education Branch to carry on an educational program which will bring the facts about water pollution to the attention of the people and stimulate community action for needed local abatement projects.

A report summarizing the data in the 15 drainage-basin documents, and presenting in nontechnical language the national pollution picture, has been published for more general distribution throughout the Nation. This report indicates that more than 10,000 treatment plant projects were needed as of July 1, 1950, including about 6500 municipal sewage-treatment plants and nearly 3500 industrial plants. It reveals that there were more than 22,000 sources of pollution in the United States, 11,800 municipal sources and 10,400 industrial sources.

A series of brief nontechnical digests of the drainage-basin reports are being prepared for widespread distribution by the States in each of the basins. These are intended to help bring home to the affected communities the necessity for local action to correct the specific situations reported. Each pamphlet presents in simple terms related directly to the local situation, what the problem is, what is causing it, what the solution is. It points out what has been done, and what still needs to be done to improve the quality of the area's waters.

TECHNICAL SERVICES —— Co-ordination of the technical aspects of the Federal program to assure that the services provided are in accordance with the needs of the States is the responsibility of the Technical Services Branch. In carrying out this task, the Branch has worked closely with the States, with other Federal agencies engaged in programs having some relationship with water resources or the problem of water pollution, and with industry. The work with industry has been carried on principally through the National Technical Task Committee, whose operations will be discussed in greater detail a little later.

ENVIRONMENTAL HEALTH CENTER——The Environmental Health Center carries on research related to fundamental stream-pollution problems. Its investigations are designed to provide the basic information required for the establishment of water-quality objectives and for the development of improved pollution-abatement methods.

The Center also provides assistance to the States on specific problems having particularly difficult technical aspects. It further assists the States and others engaged in pollution-abatement work by conducting training courses designed to increase the technical knowledge of personnel in this field.

Appropriations providing for the construction of a new laboratory for the work of the Center were authorized by the Water-Pollution Control Act in 1948. The anticipated completion of these new facilities in 1953 will permit more effective performance on the increasingly important activities of the Center.

INDUSTRIAL WASTE PROBLEMS ——During recent years, a great deal has been accomplished by industry toward the abatement of pollution caused by industrial wastes. Some of the major industrial categories have given particularly tangible evidence of an acceptance of their share of responsibility for protecting the quality of the Nation's water resources. Firms in related production fields have joined in co-operative efforts to find solutions to their waste problems, providing technical personnel and funds in impressive amounts to carry on the work. The attention being given to the problem of wastes disposal by those groups is as careful and scientific as that given to other aspects of their operations.

The *pulp, paper, and paperboard* industry, for example, has made tremendous progress in defining its industry-wide problems. Outstanding improvements have been made in both recovery and disposal methods and are being widely applied. Treatment and disposal methods developed as a result of studies carried on by the *canning* industry are now in operation at many canneries. Studies made by the *petroleum* industry have resulted in developments, such as the API separator, which has greatly reduced oil pollution. In this field, the problem of removing taste- and odor-producing materials still remains, but with continued co-operative efforts its solution will undoubtedly soon be found.

NATIONAL TECHNICAL TASK COMMITTEE——The results achieved by these industrial groups gave such practical evidence of the effectiveness of team work in solution of waste-disposal problems that a broader application of this principle of co-ordinated efforts was proposed. The plan called for the establishment of a nation-wide committee of industries having the following functions:

1) To inventory, appraise, co-ordinate, and promote research in developing methods of using, treating and controlling industrial wastes.

2) To facilitate the devising and adoption of uniform methods of measuring and evaluating trade wastes in water-quality control.

3) To stimulate more effective working relations on technical phases of trade-wastes problems in industry and among Federal, State, and local agencies.

4) To advise on employment of the facilities of the Environmental Health Center in those areas of research and development wherein they would be the most valuable to the over-all program.

5) To aid in establishing those areas where major need exists for financial assistance in obtaining basic information on industrial waste problems in water-pollution control.

6) To stimulate further the adoption of practical methods—known or yet to be developed—for reclaiming, reducing, and treating wastes impairing natural stream conditions.

7) To achieve wide dissemination of information on technical developments and the accomplishments of Industry; to maintain suitable relations with technical societies, professional organizations, trade associations, and such other groups as issue publications reaching persons

concerned with water-pollution problems.

8) To aid in promoting training activities to increase the operating efficiency of waste recovery and treatment systems employed by Industry.

9) To perform such other technical tasks relating to industrial wastes as necessary to stimulating improvement in the quality of the Nation's water resources.

The proposal for the establishment of this committee was enthusiastically approved by the Water Pollution Control Advisory Board.

The Surgeon General then invited representatives of major industrial categories throughout the Nation to meet with him for the purpose of forming a National Technical Task Committee on Industrial Wastes, whose members would work together and with the Federal Government towards finding solutions to pollution problems caused by industrial wastes.

Several sections of the Water Pollution Control Act' contain language providing a basis for such co-operative work with industry.

Section 1 of the Act states that, in addition to recognizing, preserving, and protecting the primary responsibilities and rights of the States in controlling water pollution, it is the declared policy of Congress to "support and aid technical research to devise and perfect methods of treatment of industrial wastes which are not susceptible to known effective methods of treatment, and to provide Federal technical service to State and interstate agencies *and to industries. . . .*"

Under Section 2 of the Act, the Surgeon General of the Public Health Service is directed to "support and aid technical research, to devise and perfect methods of treatment of industrial wastes which are not susceptible to known effective methods of treatment; to make available to State and interstate agencies, municipalities, *industries,* and individuals the results of surveys, studies, investigations, research, and experiments. . . ."

Section 3 permits the Surgeon General, upon the request of any State water-pollution agency or interstate agency, . . . "to conduct investigations and research and make surveys concerning any specific problem of water pollution confronting any State, interstate agency, community, municipality, or *industrial plant,* with a view to recommending a solution."

And finally Section 4 directs the Surgeon General to . . . "Prepare and publish, from time to time, reports of such surveys, studies, investigations, research, and experiments made under the authority of this Act as he may consider desirable together with appropriate recommendations with regard to the control of water pollution."

All through the Act, the need for co-operation among the agencies concerned with the water-pollution problem is continually implied. The various agencies are repeatedly listed together as a series—— parts of a whole. There is a clear intention to stress the importance of close and satisfatcory relationships among the parties involved.

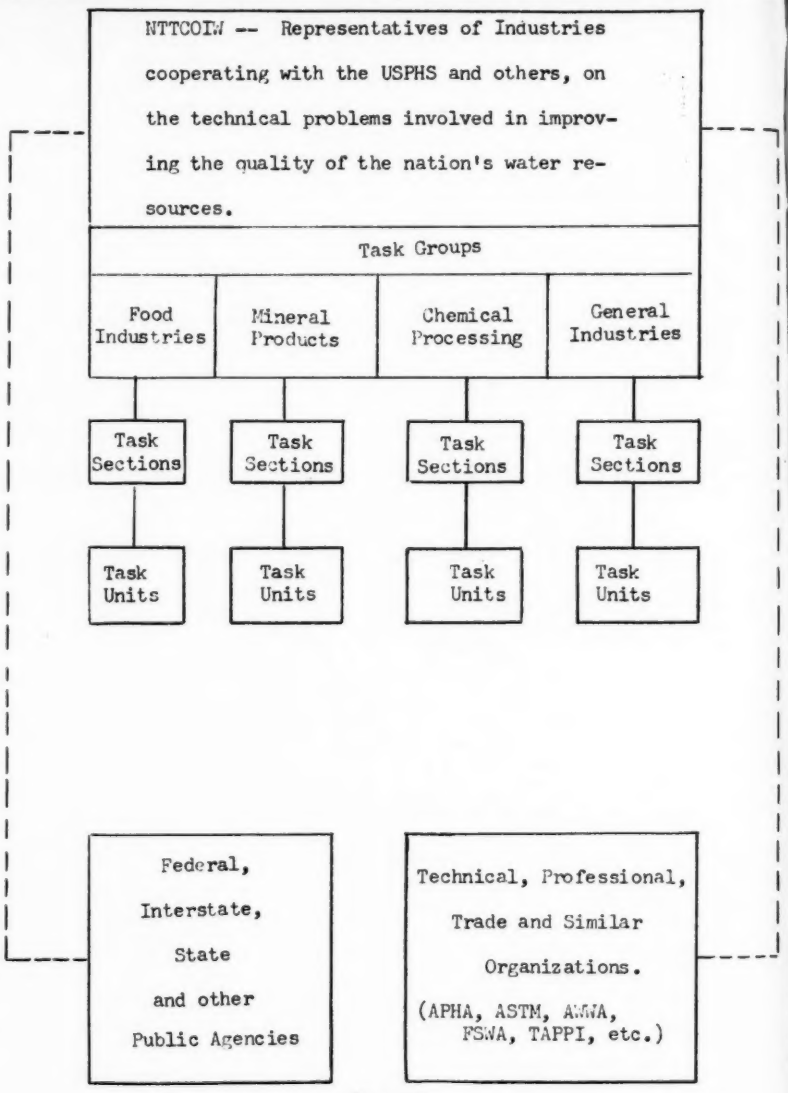

NTTCOIW -- Representatives of Industries cooperating with the USPHS and others, on the technical problems involved in improving the quality of the nation's water resources.
Task Groups
Food Industries
Mineral Products
Chemical Processing
General Industries
Task Sections
Task Sections
Task Sections
Task Sections
Task Units
Task Units
Task Units
Task Units
Federal, Interstate, State and other Public Agencies
Technical, Professional, Trade and Similar Organizations. (APHA, ASTM, AMWA, FSWA, TAPPI, etc.)

Figure 1
National Technical Task Committee on Industrial Wastes Organization Chart

At the initial organization meeting in May 1950, a committee was formally established and drew up the broad outlines of a new Industry-Federal Government approach to the control of water pollution caused by industrial wastes. It was agreed that the Committee's purpose would be "to effect an improvement in the quality of water resources in the Nation," and "to perform technical tasks pertaining to industrial wastes in co-operation with the Public Health Service and all others concerned with improving the quality of our water resources."

The Committee set for itself three initial tasks:

1) To assemble a list showing sources of information on processes and practices known for using, treating, and controlling industrial wastes.

2) To assemble a tabulation of research projects concerned with utilization, treatment, and disposal of wastes, those underway and those contemplated.

3) To provide a list which will define problems that confront a given industrial group and for which there is no satisfactory solution; particularly those which are common to more than one industry.

Four major "task groups" were established to act as working committees in

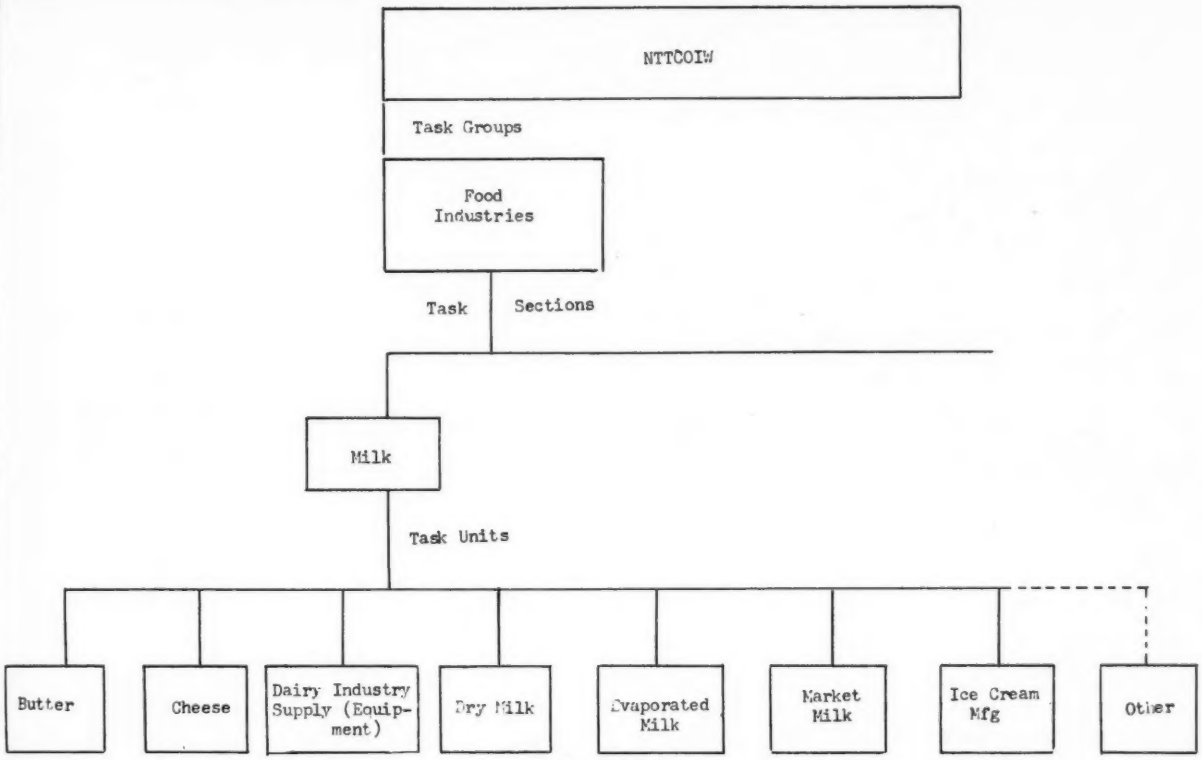


Figure 2
National Technical Task Committee on Industrial Wastes Organization Chart

carrying out the functions of the Committee at large: Task Group I—Food Industries; Task Group II—Mineral Products Industries; Task Group III—Chemical Processing Industries; and Task Group IV—General Industries. The organization plan is shown in Figure 1.

Subsequently, task sections and task units were established to expedite the work in various special product groups. This is illustrated by Figure 2. This has encouraged wide participation in the technical tasks confronting the Committee.

At its second meeting held in Cincinnati in January, 1951, the Committee gave assistance in the evaluation of research and development work concerning water pollution being conducted by the Environmental Health Center. Inventories of industrial-wastes research projects currently in progress and pending were reviewed. Co-operative investigation of problems common to more than one branch of industry was stimulated. An industrial waste guide on beet-sugar wastes was considered, the first of a series that is being assembled through studies aided by the Task Committee.

Consistent progress has been reported at subsequent meetings held in November, 1951, and June, 1952. The developments show that industry is moving forward toward its objective of reducing the volume of wastes reaching our water resources.

Much of the technical work of the Committee is being performed by work groups composed of the best technical talent available in the industries having membership in the Committee. By bringing together industries which have common waste-disposal problems, duplication of effort and unnecessary expense can be substantially reduced. Likewise, there is considerable advantage in endeavors of this kind in being able to assign the various tasks to groups best equipped and staffed to conduct the particular studies involved. An increasing exchange of fundamental information applicable to the individual problems of participating industries is taking place, as additional groups become active in the work of the Committee.

It is not the purpose of the Committee to replace or in any way to conflict with activities that already have been sponsored, organized and financed by various industries. Rather, it is intended to broaden the base of technical investigation and to increase the understanding of the potentialities of stream improvement in a way that will be beneficial to industry and government alike.

The question of "yard sticks" of pollution for all water uses is one typical and fundamental problem for which there is pressing need for suitable definition. This technical problem affects, in one way or another, every industry that discharges wastes into natural water sources. The answer can be found only through consultation and general agreement. The solution depends upon close working relations —team work.

As industrial production increases, larger supplies of water of suitable quality will be required. These industrial developments together with increased population in existing and new centers of production, will result in added pollution unless proper control measures are taken. Special attention must be given to treatment of wastes in areas of limited water resources where re-use will be required for future progress.

CONCLUSION

Although all activities have not been covered in detail, it is hoped that the discussion will give you an idea of the co-operative program that is being carried on with the States, interstate agencies, industries, and others who are concerned with conserving the quality of water resources.

In-Plant Process Control for the Reduction of Waste*

R H SOUTHER

Cone Mills Corporation

INTRODUCTION

CONTRARY to public opinion there long has been an interest in treatment of waste by the textile industry. More recently, interest in water conservation has resulted in the enthusiastic promotion of co-operative research in the treatment of all industrial waste waters. The tremendous increase of new industries throughout the nation has posed an ever-increasing problem in the minds of the planners as to water supply and disposal. In general, industry recognizes the importance of the proper use of water: that is, having a plentiful supply of pure water, using it and returning it to the streams in good condition, for others to use in turn.

Outstanding pioneering work in treatment of textile waste was done in the late 20's when research was carried out in Greensboro, N C, by the Textile Foundation through grants to the University of North Carolina and in co-operation with the North Carolina State Board of Health, the City of Greensboro, and Cone Mills Corporation. Some of the most conspicuous work in the published data on the treatment of textile waste was done by the collaborative efforts of the Textile Foundation group under the leadership of H G Baity at the Proximity Print Works Plant of Cone Finishing Co. The published works of M S Campbell *(1)*, Ralph Porges and H J Miles *(2)*, H F Chrisco, A M Worth, John C Geyer, William Perry, and G F Catlett *(3)*, aided by the work of E H Moss and N H Kellam attest to the splendid contributions made through these co-operative efforts in its quality of research and its value to the industry. It is interesting to note the splendid cooperation given by other textile firms in North Carolina, such as Cannon, Cramerton, Sayles, Mooresville, American Yarn, Kerr, Erwin, Durham, Roanoke, Aberfoyle, Cloverdale, North Carolina Finishing and Dyeing to mention a few. Vast sums of money have been spent on the treatment of waste by this group, and hundreds of thousands of dollars have been spent by individual companies on chemicals alone, not to mention equipment and research. The fields covered by these research reports published over twenty years ago included textile waste from kier treatment, bleaching, sulfur dyeing, direct dyeing, aniline-black dyeing, printing, and indigo dyeing. It might interest you to hear some of the highlights of their findings 15

R H Souther

or 20 years ago. The work was carried on partly in our laboratory at Proximity Print Works. I was exposed to it but did not actively participate and certainly expect no credit whatsoever.

HISTORICAL

Up to 1920 the chemicals for treating wastes were about the same as now, namely, alum, chlorine (in form of chloride of lime, or calcium hypochlorite), lime, copperas, and sulfuric acid. One new one, calcium chloride, was introduced at that time for treating the waste from indigo and sulfur-dyeing operations. The research involved in the selection of this treating agent, its laboratory trial, and reporting, required only the amazing short period of 24 hours, and an overnight settling of the known and experimental coagulants involved. Actually, it was Ben Cone of Cone Mills Corporation who supervised the first plant trial of calcium chloride at the Proximity Mills in 1920 and confirmed its goodness as a precipitant for indigo and sulfur dyes. The waste materials requiring treatment were a "natural" for calcium chloride, as may be observed from its reactions in precipitating colorless or white sulfides, sulfites, sulfates, and carbonates. Copperas, or iron salt, darkens the waste effluent.

The dyes, indigo and sulfur colors, which were held in solution by the alkalies and sulfur compounds before treatment are precipitated when alkalies and reducing chemicals are neutralized.

This method was used for 17 years very successfully for treatment of wastes at one of our plants or until the waste was diverted to the City of Greensboro North Buffalo Disposal Plant. However, at another of our plants, it would not work with indigo wastes, because these wastes did not contain sulfides, which seemed to help instead of hinder coagulation. There it was found by A O True *(4)*, Sanitary Engineer, Cone Mills Corporation, that alum and sulfuric acid were better for treating indigo dye waste. Also, it was found very effective to spray the waste dye liquors over a large area of hillside land and by aeration, trickling, and absorption by earth, clarify most of the impurities. At least this method seems to be about as efficient as some others in use throughout the country.

As a result of the researches of the Textile Foundation *(5)*, and the late Catlett (5), the Greensboro disposal plant was built in 1938 primarily for sewage, but later mill waste was added. Mill waste can be treated more cheaply when mixed with domestic sewage than when separate treatment is used. Some feel, if methods can be worked out to reduce alkalinity, such as neutralization by carbon dioxide recovered from power plant stacks that the problem of textile wastes might be largely solved. Sulfuric acid and alum were formerly used for treatment in an activated-sludge process at North Buffalo Plant, Greensboro. Copperas and lime are used for replacements because they are more economical, but the pH in this process is so high that the activated-sludge process will not function and must be by-passed. If proper pH adjustment is made on the textile waste and the proper dose of coagulant is applied, this plant could function more efficiently *(9)*.

Na_2CO_3 *sodium carbonate*	+	$CaCl_2$ *calcium chloride*	→	2NaCl *sodium chloride*	+	$CaCO_3$ *calcium carbonate*
2Na(OH) *sodium hydroxide*	+	$CaCl_2$ *calcium chloride*	→	2NaCl *sodium chloride*	+	$Ca(OH)_2$ *calcium hydroxide*
Na_2S *sodium sulfide*	+	$CaCl_2$ *calcium chloride*	→	2NaCl *sodium chloride*	+	CaS *calcium sulfide*
Na_2SO_4 *sodium sulfate*	+	$CaCl_2$ *calcium chloride*	→	2NaCl *sodium chloride*	+	$CaSO_4$ *calcium sulfate*
$Na_2S_2O_5$ *sodium sulfite*	+	$CaCl_2$ *calcium chloride*	→	2NaCl *sodium chloride*	+	CaS_2O_5 *calcium sulfite*

The following data pertaining to the present sewage disposal system have been secured:

1) Capacity—Designed for 6,500,000 gal daily (24 hours)
   Now running 10,000,000 gal daily
   a. 8,500,000 gal domestic sewage
   b. 1,500,000 gal textile waste

2) Cost of Chemical Treatment:

Combined sewage and waste—	$15.00 per 1,000,000 gal
Textile waste only—	$65.00 per 1,000,000 gal
Approximate daily cost—	$75.00 sewage
Approximate daily cost—	$100.00 textile waste

   Est cost in 1952—about $25,000 to $50,000 for chemicals

3) Recovered By-Products:
   a. Gas—value, about $8,000 annually
   b. Fertilizer—value, about $6,000 annually

4) Chemical Treatment:
   a. Textile waste in dye pond—2,000 lb chlorine daily. Chlorine added daily to oxidize sulfide to prevent black precipitation of iron salts in later treatment.
   b. Mixed domestic sewage and oxidized treated textile waste run into disposal plant and treated with lime and copperas to precipitate solids by flocculation. The pH of incoming dye waste is 10.8, and pH of ultimate effluent ranges from 7.5 to 8.5.
   c. The sludge from (b) is run into settling basin (primary) to remove solids.
   d. Solids from (c) are removed by a suction pump to a digestor (closed treated tank) where the organic solids are decomposed by bacterial action:
      1. The gas from digestor is trapped to a storage tank for use in generating electric power for plant use. The savings amount is about $8,000 per year.
      2. Sludge is further concentrated by vacuum filtration from about 7% solids to 25% solids. The concentrated sludge is run onto open fields, sun dried, for about six weeks, then pulverized and used as fertilizer for lawns. This recovery represents about $6,000 annual savings by plant operation, by elimination of cost of hauling away.
   e. The supernatant liquor from primary tank is run into a secondary tank where a further settling of solids occurs.
      1. The solids from this treatment are returned to primary tank and thus to digestor and subsequent channels.
      2. The supernatant liquor from secondary tank is run directly into creek.

The plant was originally designed for an activated-sludge process, but the high alkaline content of dye and mill wastes in the sewage killed the bacteria in the aeration basins in this process. Activated sludge has the highest efficiency but the primary settling treatment shows an advantage in cost.

In spite of the fact that only 18 plants out of the 47 plants surveyed through questionnaires by the National Association of Finishers of Textile Fabrics would join with the municipal system, the research of the Textile Foundation shows that mill waste can be treated more cheaply when mixed with domestic sewage than when separate treatment is used.

As to whether a plant, if and when called upon to install a sewage disposal system, would consider a separate system or would consider joining with the particular municipality, the replies showed 20 plants would install separate systems, 18 plants would join with municipal system, 3 were undecided, and 1 had insufficient data for decision. It appears to be a question to be decided by finding the best solution to a local problem.

Legislative bodies throughout the country are being pressured for more stringent laws in regard to industrial wastes, as pointed out by Lyman Cox *(6)* in an address before this body at our 1950 National Meeting in Portsmouth, New Hampshire. It is felt by the textile industry in general that a fairly sound law is desired, but that its administration must be carefully executed in a most practical manner to secure maximum co-operation and benefits, and to avoid undue expenditure of large sums of money just to satisfy an arbitrary specification of an impractical board. Most states, 38 in all, have laws and powers to issue orders. Three states, New Hampshire, New York, and New Jersey have boards that set up standards of classification. Last year North Carolina enacted a law patterned after that of New York, providing for stream classification and permits. There are only five states with no laws.

A good source for research studies is the question of the efficiency of lagoons. The late G F Catlett *(3)* observed that shallow lagoons are the most efficient. He also stated that a lagoon increased the ratio of textile waste that can be handled with domestic sewage. The ratio of textile waste that can be mixed with domestic sewage can also be increased by aeration, pH adjustment, and chemical coagulation. Others, however, may not agree that any sizable proportion of industrial waste can be mixed with domestic sewage, and research is thus being stimulated on this controversial subject. A great deal of thought is also being given to the various methods for treating waste effluent, such as by neutralization, precipitation, equalizing, coagulation, and oxidation. A method that apparently offers the greatest opportunity for improving quality of waste is that of oxidation, both by chemical and biological methods. Trickling filters and a rocky stream bed have been found to reduce biochemical oxygen demand of waste greatly at a very low cost.

J A McCarthy *(7)*, in a speech before the Northern New England Section, AATCC, in Boston in 1950, stated that a million gallons of well-aerated water may be expected to receive without nuisance waste equivalent to about 67 lb of BOD. Probably a much greater amount can be received if a rocky stream bed gives exceedingly great aeration. However, this fact emphasizes even greater need for more research to reduce the amount of oxidizable wastes by using minimum amounts of chemicals in plants.

In spite of all the vast array of published data there is still an urgent need for further research in individual plant problems. In the textile industry as well as in other industries the greatest benefit can be obtained from research and studies to eliminate waste at the source in the plant, in other words, by reducing the amount of chemicals to be dumped into the stream. However, there are so many useful parallels that textile chemists should take advantage of the many good studies that have already been made, particularly since it may reveal a valuable approach to a new and exciting study.

AATCC PLANS

Realizing the need for better serving its corporate members in obtaining and disseminating information on the available data pertaining to the solution of stream sanitation problems, the National AATCC has set up a National AATCC Stream-

Pollution Committee. This Committee will tie in with the National Technical Task Committee, both receiving and imparting information, and will in turn disseminate data through the Sectional Committees. The National and Sectional Stream-Pollution Committees will serve the textile industry and especially its corporate membership in connecting it with the other sources of available information, such as the work of the Textile Foundation, Ohio River Valley Authority, research of the various trade associations, and the data collected by the National Technical Task Committee on Industrial Waste. This last committee has been formed under the provisions of Public Law 845, the Federal Law on Stream Pollution, which is being administered by the Federal Security Agency. It is also proposed to tie in the Sectional Committees of the AATCC and state and local agencies who are interested in pollution problems in respective areas. Many of the various sections of the AATCC have organized their own separate Stream Sanitation Committees, and each will work on projects best suited to their individual section. Although a good many feel that most good can be accomplished by concentrating research on problems in eliminating waste, a real need exists, however, for better methods of analysis and evaluation of biochemical oxygen demand, and it may be expected that the National AATCC Stream Pollution Committee will set up subcommittees for this purpose.

Inspired by the introduction of new instruments, textile chemicals, and great technological advancements in the application of these chemicals to textiles, a large number of members in our section have been interested in organizing as a committee to study the problem of separating waste water into two parts: one, that which requires treatment; and the other, that which does not require treatment, so as to keep the volume requiring treatment as small as possible. Such a committee, the Piedmont Section Research Committee on Steam Sanitation, has been set up with these objectives in mind.

IN-PLANT CONTROL OF WASTES

This Committee is still in the formative stage, but it is gratifying to note at its first meeting the increased interest in textile waste problems which centered mainly around the In-Plant treatment. In this report results showed big savings in chemical costs in certain vat-dyeing operations by the Con-Mil Method (*8*) for measuring reduction potential values developed in our own laboratories in 1941 for evaluating and controlling dyeing and bleaching operations.

By means of spectrophotometric curves, studies were made of the effects of different redox potentials, as controlled by variations in concentrations of hydrosulfite, alkali and dextrine, on the shades of vat dyeings. These studies were conducted especially for the pigment-pad method of vat dyeing in Williams Units, by which it was found just how little hydrosulfite can be used for successful vat dyeing; in the instance cited 0.66% of hydrosulfite was adequate. By the use of redox potentials and other modern methods of control, the amounts of chemicals for vat dyeing can be minimized to ease the problem of waste disposal and yet to maintain the best quality of dyeing.

Also, it was reported that some research would be carried on jointly between the Southern Dyestuff Corporation and Cone Mills Corporation to reduce the amount of sodium sulfide going into streams. This was to be accomplished not only by a change in the method of dyeing, but by changes in the manufacture of the dyestuff itself, a joint project that appears unique in co-operative research efforts to abate stream pollution. In less than three weeks, this experiment had become an accomplished fact and the progress report is most gratifying, thanks largely to the efforts of C F Gibson of Southern Dyestuff Corporation and H L Mercer and M J Fields of Cone Mills Laboratory. Results indicate that one-third to one-half of the sulfides can be cut out of the exhaust dye liquor at the end of the dyeing cycle on a sulfur-black shade. However, the same technique was not successful on a certain sulfur-green dyeing. The depth was good but the cast was yellower.

In this experiment three dyeings were made. Dyeing #1 was made with a regular dye and with normal amounts of alkali and sodium sulfide, Dyeing #2 with Special Dye containing lower amounts of alkali and sodium sulfide, and Dyeing #3 with Special Dye containing less alkali and sodium sulfide and with added acid sodium phosphate. The first two experiments showed that, when the normal amounts of sulfide and alkali used for dyeing the sulfur black were decreased, there was an increase in depth of shade, a decrease of about 1/3 in sufides present in the spent liquor, about 60% decrease in phenolphthalein alkalinity in the spent dye liquor. By decreasing the amount of detergent in the soaping bath by 50%, along with the decrease in the sulfide and alkali content, the chlorine demand of the soaping liquor was decreased from 400 ppm to 32 ppm.

The third dyeing was carried out with the same Special Dye (sulfur black) as in Dyeing #2, but with the addition of 20 lb of acid sodium phosphate; the sulfide content of the spent dye liquor was decreased about 50%, the phenolphthalein alkali content was reduced to zero, the pH of the spent dye liquor was reduced to 7.5.

The results above indicate a savings in dye materials and that less sulfide and alkali waste would result from either Dyeing #2 with Special Dye containing less alkali and sulfide, or Dyeing #3 with Special Dye and addition of acid sodium phosphate to dye bath.

Other textile plants are initiating similar research projects, notably Cannon and Crompton-Shenandoah, which have installed pilot plants.

These examples and others conducted in our laboratories with our own Con-Mil Redox Method show how evaluations can be made to avoid unnecessary waste of dyestuffs. By the use of these same or similar instruments developed by others further studies may be made to determine the amount of chemicals needed in neutralizing or coagulating the waste. Thus the textile plant can accomplish three important results: (1) Curb pollution of streams by reduction in amount of wastes being emptied into streams, (2) Effect savings by using less chemicals for textile processing, and (3) Reduce cost of treating textile waste. In this field are many opportunities for renaissance in research in textile waste that will insure efficient and economical methods and a clear, clean-flowing effluent to the streams in the valley.

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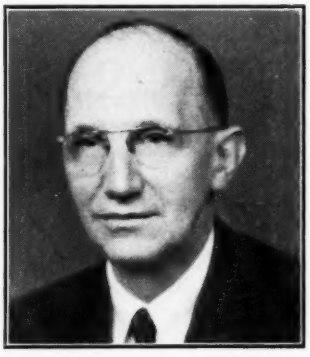
Activities of the American Association of Textile Chemists and Colorists National Stream-Pollution Committee

PERCIVAL THEEL, *Chairman*

POLLUTION of streams by industrial waste water has been a growing problem and has alarmed public health officials, sportsman groups, etc. Laws have been enacted in many states concerning it. The problem has been studied for a little more than ten years, and its science, engineering and legislation are, therefore, in early stages of organization. Investigations have recognized that a compromise between extremes of highest purity of waste water and uncontrolled pollution is necessary. Much information has been published, but it needs to be collected and abstracted so that the specific application to textile problems may be directly available. While legislation is being formulated, there is opportunity for the textile industry to study its problems, to find out what solutions are available and what problems need further research.

In order to help the textile industry in the problems of stream pollution, American Association of Textile Chemists and Colorists Stream-Pollution Committees, both national and sectional, are being organized. The National Committee is composed of one representative from each section of the AATCC. The sectional representatives are appointed by their sectional chairmen. The formation of sectional stream-pollution committees has been requested, and Piedmont, Philadelphia, Rhode Island and New York Sections have so far established such committees.



P Theel

The National Committee was organized in June 1952 under the temporary chairmanship of Ed Leonard. A second meeting was held in September 1952, and officers were elected for one year. The aims and objectives so far decided upon are as follows:

1) That the AATCC Stream-Pollution Committee shall concern itself with industrial wastes only and shall not concern itself with disposition of sewage from textile mills. The extent to which sewage disposal shall be considered will be limited to the application of sewage-disposal equipment for handling textile industrial wastes and to the effect of such wastes upon sewage-disposal systems.

2) To encourage, inspire and promote technical investigations on specific problems.

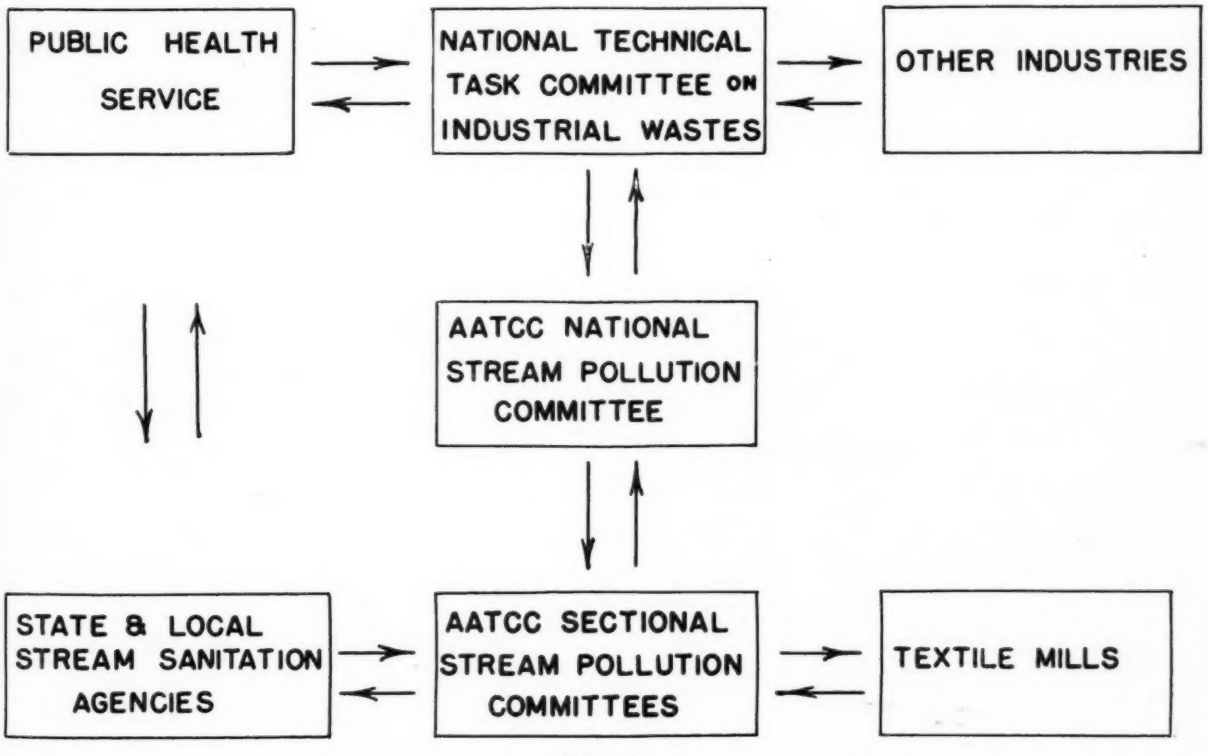

PUBLIC HEALTH SERVICE
NATIONAL TECHNICAL TASK COMMITTEE ON INDUSTRIAL WASTES
OTHER INDUSTRIES
AATCC NATIONAL STREAM POLLUTION COMMITTEE
STATE & LOCAL STREAM SANITATION AGENCIES
AATCC SECTIONAL STREAM POLLUTION COMMITTEES
TEXTILE MILLS

Figure 3
AATCC participation in exchange of technical data on stream pollution

3) To co-operate with the National Technical Task Committee on Industrial Wastes and to further the aims and objectives of that body within the textile wet-processing industry.

4) To study new methods for examination of textile wastes.

5) To publish case histories.

6) To study BOD determination as a measure of pollution by textile wastes in comparison with APHA methods.

7) To study specific chemicals used in textile manufacturing as related to pollution.

Activities that are considered to be of great immediate value include the following:

1) Preparation of a bibliography on past and current research and on methods of textile waste treatment.

2) Preparation of a glossary of terms related to industrial waste disposal.

3) Study of test methods for examination of industrial wastes for determining their applicability to textile wastes.

4) Preparation of a chart or abstract of existing laws and regulations on industrial waste disposal.

5) Compilation of information on means of financing waste-disposal plants.

6) Exchange of information with Federal, State and municipal authorities.

The following assignments have been made to reach some of the above objectives:

1) Each sectional representative is to organize a sectional committee on stream pollution at his discretion and in accordance with sectional policies.

2) The Philadelphia Section is to circulate for review and correction a charted abstract of existing laws and regulations of pollution abatement. This chart is to be published when corrected.

3) The Piedmont Section is to start preparation of a reference bibliography on stream-pollution literature in the textile field. Other sections are to forward all available references to the Piedmont Section for screening and compilation.

4) The Rhode Island Section is to prepare a glossary of terms related to waste identification, disposal and treatment, specifically related to the textile industry, and to undertake a study of BOD measurement on textile wastes.

5) The Western New England Section is to prepare for publication a case history on waste evalution or treatment.

PANEL DISCUSSION

PANEL OF EXPERTS

Name	*Association*
Prof M G Burford	Hall Laboratory of Chemistry Wesleyan University Middletown, Connecticut
Prof Henry Campbell	Acting Dean, College of Engineering University of Rhode Island Kingston, Rhode Island
John M Gould	Plant Chemist Barre Wool Combing Co South Barre, Massachusetts
Joseph C Knox	Secretary, New England Interstate Water Pollution Control Comm
Joseph A McCarthy	Chief of Laboratory, Lawrence Exp Sta Dept of Public Health Commonwealth of Massachusetts
R Hobart Souther	Dir of Research, Cone Mills Corp Greensboro, N C
Clarence I Sterling, Jr	Director, Div of Sanitary Engineering Dept of Public Health Commonwealth of Massachusetts
Prof P Theel Chairman, AATCC National Committee on Stream Pollution	Coordinator of Research Philadelphia Textile Institute Philadelphia, Pa
Dr L F Warrick	Chief, Technical Services Branch Division of Water Pollution Control U S Public Health Service Washington, D C
Dr Harold Webber	Executive Director Lowell Technological Institute Research Foundation, Lowell, Mass

Chairman Leonard: The first question is directed to Dr Webber. Just what is meant by the term "Stream Pollution" as related to the textile industry?

Webber: Such a general question probably deserves only a general answer. One can say that anything that is introduced into a stream that impairs its usefulness is a pollution contributor. However, more specifically, organic materials which will require oxygen for degradation by microbiological mechanisms are pollutional factors. It is obvious, of course, that, with wool scouring wastes and other sources of organic materials introduced into streams, solids that will settle impair the usefulness of the stream for whatever function it has been classified to perform. The presence of silt in the stream might inhibit the normal functioning of the photosynthetic flora, which of course is consuming CO_2 and releasing oxygen and contributing to the aeration of the stream in terms of oxygen content.

Industrial wastes, particularly those from textile plants, contribute very little in the way of pathogens, but the remote possibility is there. Domestic sewage might contribute organisms, of course, which would impair the streams from the source of flow of the water. There are odors, color, taste, and all factors present in textile waste, which will impair the usefulness of a stream. These are what one might seek in the influence of textile plants.

Q: Why do we have "all the fuss' about stream pollution in the last few years, whereas a few years ago, we heard nothing about it?

Sterling: There is a growing importance in the matter of conserving our water resources. We have learned, in many sections of the country, that water resources are our most valuable asset. It is difficult to replace or substitute for it. We have had a great increase in our population, and we have a greater industrialization, and a continual increase in the use of water, so that we have a need for keeping our water in good condition.

In addition, we have a greater recreational use than we had, formerly. We have an increased public demand and an increase in the use of water for recreational purposes. The five-day work week, in itself, allows two days, and sometimes three and four in a week to permit people to go out and make use of our recreational resources. So that today, our biggest public demand comes from the recreational sources.

We also have the need of industry itself in locating their plants, developing new processes, where they require a large amount of clean water. And, the only way that we can have clean water available is to be able to re-use the water that has already been used in many of our streams.

Q: Why is it that sometimes the dissolved oxygen content of a river is moderately high just below a textile plant, while it may be low or even zero a few miles below the plant? Also, what can be done to cause the river to return to its normal dissolved oxygen content at some point nearer to the plant?

McCarthy: This answer might well take the form of a two-week discussion. A great deal of the status of oxygen in a stream depends not on how much waste has been introduced into the stream, but how fast that can react with the oxygen of the stream. You have to assume that bacteria act as the intermediaries in using up the oxygen in the stream. So that it is quite possible, immediately below a plant, to have a large amount of potential reducing substances, which have not had a chance to use the oxygen of the stream.

As to the second part of the question, the best way to prevent oxygen being depleted anywhere is to remove the pollution. It is quite possible that you may get some reduction by elimination, which would reduce the over-all demand and move up a high oxygen level nearer the plant.

I don't think that there is any trick implement devised to remove or reduce the lag period, causing the oxygen demand to appear at a greater distance below the stream. That is about one-tenth of one per cent of the possible answers to the question.

Q (addressed to Mr Knox): I understand that your Commission is undertaking the classification of interstate waterways, in accordance with the standards A, B, C, D and E, adopted by your Commission. This classification of any river I believe, will be made only after due consideration of such factors as the economic importance of all industrial plants that may be located on the river, reasonable uses for the stream, and an investigation of all pollutional sources, industrial and municipal, on the stream.

After these classifications have been made, what is the likelihood of the Commission revising their classification a few years later; a change which might be of considerable cost to the industries that might be affected?

In answering the question, I would suggest that since this is a national convention and there are many people here who are not from the New England area, you might mention the origin and the purpose.

Knox: In accordance with that suggestion, I should like to read the following statement about the Compact and its objectives:

The New England Interstate Water Pollution Control Compact was conceived by the State Sanitary Engineers of New England as a means of developing a plan whereby the States might co-operate in the control of pollution of interstate waters in the area.

This compact was ratified by the States of Massachusetts, Rhode Island and Connecticut in 1947, and was approved by Congress in that year. In 1949, New York became a signatory to the Compact, the Compact providing that New York might become a member, insofar as they had waterways common with New England. In 1952, New Hampshire and Vermont also entered the Compact.

The demand for regulatory pollution control legislation had resulted in the enactment of statutes vesting State agencies with the control of pollution. However, where interstate waters are concerned, a single state cannot wholly control pollution and as New England is virtually a network of interstate streams, the approach is logically under the Compact arrangement. The Commission which administers the Compact is composed of representatives of the State water pollution control agencies, the State health departments, and also representatives of industry, conservation, municipalities, etc.

In addition the Technical Advisory Board of the Commission includes the Directors of the State water pollution control agencies.

The Compact is built around a classification of interstate waters, according to their highest use, based on physical, chemical and bacterial standards adopted by the Commission.

This is important. Each signatory State agrees to submit classifications of its interstate waters to the Commission for approval. Then, each State is obligated to establish programs of treatment of sewage, and industrial wastes to bring about the improvements required to meet the approved classification.

The success of the Compact depends upon the co-operation and support of the States. There are no provisions for the exercise of broad, mandatory powers by the Commission. The Commission has no powers to issue orders, or to finance or construct treatment works, but in reality is an agency of the signatory states, co-ordinating a mutually agreed upon plan to improve the sanitary conditions of our waters.

I think that perhaps what I have said will straighten out where the Compact fits into the pollution control picture.

And now, to answer the question about the likelihood of revising classifications once they have been adopted by the Commission, I would say that the classifications have been approved by the Commission only after careful study by the various States. There have been public hearings held, and they will be held in each instance.

There have been private conferences by the States with the various industries concerned, and classifications have all been more or less mutually agreed upon by all the interests concerned, before they are submitted to the Commission. The interests of conservation and recreation have been provided for and will be in each classification.

I feel that industry can be assured that they have freedom from fear of any increase or any raising of the adopted classifications, because to meet those classifications which are being established, is a tremendous undertaking and involves a program which is satisfactory to all who are concerned.

Q: What problems are presented in disposing of wastes from pigment printing, where you are confronted with resin emulsions and oils?

Souther: That is quite a problem, and in addition to the oils coming from pigment printing, we might mention the oil used in the Williams Unit in regard to that phase of it.

I might only mention a parallel, and in mentioning this, I would like to keep this outside the record.

[Discussion at this point was outside the record.]

Q: What is meant by the "population equivalent" of the waste from a textile mill, and how may it be determined?

Burford: This is one of the perceptibly easy questions, as long as you don't push it too far. This is simply a comparison of industrial waste with domestic sewage. Generally speaking, you can accept an average value of about 0.167 pounds of BOD per person, per day for domestic sewage. If you accept this, you may then compare industrial waste with this, and by a very simple formula, which involves taking into consideration the volume of waste and the BOD value for that waste, you can convert it into the population equivalent. This is only a practical, working comparison of the two things, the strength of industrial waste and the strength of domestic sewage.

Q: What types of synthetic detergents have no BOD? Would you recommend their use wherever feasible, in place of soaps and other synthetic detergents that have a BOD, in order to reduce stream pollution and the amount of waste treatment required?

Burford: Well, I don't think I am going to try to pose as an expert on detergents. It does so happen, in connection with one plant in Connecticut, that we have made some investigation of the problems, and we have found, for example, that such detergents as Nacconal NR and Ultrawet 35 KX, which are both alkylarylsulfonates, and Igepal CA, a polymerized ethylene oxide condensation product, have no five-day BOD as determined by standard methods. Whether this means you can substitute them depends upon a complicated series of things.

One of the important questions is whether these detergents will have an effect on any treatment plant that gets the industrial waste. In this case we made studies of the effect of the three detergents that I have mentioned on sewage from the Middletown, Connecticut, plant. Adding up to one hundred parts per million of any of the detergents, which is about the extreme you would expect to encounter, produced no effect on the BOD of the sewage. In other words, these detergents had no toxic effect on the sewage-treatment plant.

There are a lot of other questions that might be involved, such as frothing and foaming, which would have to be investigated in any particular case. It may be that Mr McCarthy might want to add some things along that line.

McCarthy: One of the tough parts of considering that question is the fact that you can't define "no BOD."

However, we have found that some of the detergents have no apparent BOD, under conditions for which they are normally used, and yet, we found one case, while cleaning up a tank which contained and produced BOD of 300,000 parts per million. And we have found that some of the others have a very highly delayed kick and may have a beautiful 300,000 BOD.

These materials could get into the bed of a stream and stay there long enough, and then you might have a case for zero BOD, which would burn up all the oxygen of the stream next year.

As Dr Burford said, this is not simple. We can only say that many of these materials apparently do not increase our pollution problems, if they are used in a certain way.

Q: Can stable synthetic detergents become a problem, because of their low surface tension, in a waste treatment plant or in a stream?

Gould: On the previous question, I want to add this. From a mill's point of view, it is also important to have detergents that will work, and particularly the low or no BOD types.

I don't know that I can answer the second question on the low surfaces, but I would say that stable synthetics are a problem, by chemical means, for the reason that the very properties which make them useful may make them otherwise. I know that does not answer the question, but maybe somebody else will have something specifically to say about that.

Certainly, I might say this: Where there are water treatment plants that have to draw water, they get into the municipal supply. However, I think that most of it comes from the discharge of household wastes, unless there are large amounts of synthetic detergents used.

Leonard: In other words, the fact that they are stable means that they are difficult to get out.

Webber: I would like to ask whether the presence of the synthetic detergent influences the particle size, for more rapid degradation.

Burford: The answer to that question in this particular case is "No." But, I think that Mr McCarthy has given some of the dangers that go along with that matter.

Leonard: I have two questions for Professor Campbell. You have previously mentioned in your talks and publications that a separation of dirty wastes from clean waste water should be carefully studied. Do you believe that the separation of wastes is practical for many of the units in textile plants, which contain so-called dirty water at the beginning of a process, but which may contain relatively clean water during other phases of the same processing operation? For example, I am now thinking of a unit, such as a jig, in which both dyeing and rinsing operations may be carried on.

Campbell: These Panels are like the spelling bees we used to have at grammar school. We would stand at the side of the room and hope that the teacher would ask us an easy word when it became our turn to answer.

We have found, in our surveys, that it is not the usual practice to separate the waste from a processing unit, such as a jig. Separation would normally be done by valves, either operated manually or by electronic controls. The controls would be based on some characteristic of the liquor contained in the vessel, such as pH or color or something else. If installed, it would therefore limit the use of this unit to one operation, or a series of like operations. Also, electronic controls are expensive to install and expensive to maintain in operation.

It remains for small vessels, such as jigs, that are used for a number of operations, like bleaching, dyeing, etc, to be controlled manually. Therefore you must depend upon the unit operator to throw the valve in the right direction at the right time.

I think that all of you are aware that unit operators, being human, do not always do everything exactly as it is supposed to be done. I don't think that the State Health authorities or the Water-Control agencies would allow a manual set-up, because you cannot depend upon the operator to operate the valve correctly.

Then again, it would place a burden on management to attempt to educate these operators, and if you are operating all around the clock, the number of operators is increased by the number of units in operation.

So usually, it is not practical to attempt to segregate wastes from a small unit. The volumes involved are usually not very great, and the expense of trying to rig up controls would be excessive.

I should like to say that I am an advocate of you people solving most of your own problems. Regardless of the research that is being done, the construction of the waste treatment plant at any mill will probably be done by a sanitary engineer, who knows what the State Health authorities or Water-Control agency will require, and the type of treatment units that should be constructed.

Most of the investigation of an industrial waste problem can be done by plant personnel who are acquainted with plant operations. You have plant chemists who are acquainted with laboratory procedures. It isn't much of a burden for them to

gather the added information about BOD and other required determinations.

Also, you have the plant engineers, who we have found to be ingenious fellows capable of cooking up clever means of measuring flows, etc.

And so, with these personnel, you can determine the solution to three-quarters of the problem. By such means you can arrive at an estimate of the quantity and type of waste.

There is a lot in the literature that your own committee is compiling pertaining to waste segregation, so that if you know you have certain processes with a number of washes and rinses, you can tell, usually, where you can or cannot segregate. Information obtained by a complete study of the processes within your plant can be turned over to a sanitary engineer. This study should cover possible recovery of chemicals and the reduction of water usage. You can cut down on the amount of waste by cutting down on the amount of water. Here in New England, we have such an abundant supply of water that in many of the mills washes and rinses run continually, whether they are being used or not.

So I think, in answer to the question of segregation, you can solve much of it yourselves, before you call in the consulting engineers.

Burford: I should like to add that I agree with Professor Campbell about the operation of smaller units. We ought to keep in mind that this has to be worked out by the individual plant, as to whether it is economically feasible or not. Even though electronic controls may be expensive, they still may be cheaper than labor in some cases.

Two years ago, at an MIT Conference on Industrial Waste, I gave a paper about one case that I think is feasible, and I want to give you a diagram of this. We had a considerable amount of washing involved. If you simply plot the BOD and oxygen consumed, against time, you will get some amazing things, occasionally.

In the particular case we are talking about, the BOD went something like this, and the OC went like this [demonstrating on blackboard] and the conductivity went like this. It is not a terribly expensive proposition to set up an electronic device and to let it work for you.

In that particular case, we might get some place with dye wastes, using a photoelectric cell. Again, this has to be worked out for the individual case.

Campbell: In some cases, especially in dyeing and finishing plants, the segregation will amount to 35 and 40 per cent of the total volume of waste. It is a problem that should be seriously considered, because the construction of large units to treat the entire volume of waste is very, very expensive.

Leonard: We have a question here for Dr Warrick. Why couldn't polluted rivers be treated, when necessary, by a series of mechanical or diffused-air aeration units, located at various intervals along the portion of a river where pollution occurs? It should be possible to have an aerator operate automatically by a device which samples the water continuously at a point below it, and which is activated when the dissolved oxygen becomes low.

Warrick: Artificial aeration of streams has been used with beneficial results in some situations. Methods employed have varied from cascading, or use of facilities for creating turbulence at the water surface, to more elaborate equipment for diffused air aeration. For instance in the canalization of the Upper Mississippi River, special baffles were constructed to provide surface turbulence below the gates of the dam at Hastings, Minnesota. The purpose was to aid recovery from oxygen deficient conditions that were encountered at times in the pool upstream to the Twin Cities. Studies indicated that during the critical summer period around 45,000 pounds per day of dissolved oxygen was being introduced into the river water.

The important factors affecting dissolved oxygen recovery in a stream by this procedure are the amount of dissolved oxygen (saturation deficiency) in the water just above the dam, the oxygen demand (B O D) of the stream, and the head of water through the dam.

Diffused-air aeration of the entire flow of the Flanbeau River below Park Falls, Wisconsin, was undertaken by a task committee of the Wisconsin pulp and paper industry cooperating with the State. Their study was to ascertain benefits to be derived from aeration in overcoming oxygen deficiency and other conditions caused mainly by the wastes from a sulfite pulp mill. Compressed air was introduced immediately above and below a hydro-power plant a few miles downstream from the pulp mill at a rate of 1600 cubic feet per minute. Porous plates and tubes were used to diffuse the air into the water passing the plant. The amount of oxygen that could be put into the water and retained as dissolved oxygen to take care of the B O D of the waste was largely dependent upon the degree of depletion of dissolved oxygen in the water above the dam. The aeration was of special benefit in this case since it moved the zone of maximum oxygen depletion in the stream during summer months out of an area extensively developed for recreational purposes.

Automatic controls for such artificial aeration will depend on development and application of reliable monitoring devices for frequent or continuous determination of dissolved oxygen in streams.

Q: What information relative to sulfide saving has been published?

Souther: Many prefer to keep such findings confidential: however, our results may be found in the "Proceedings of the First Southern Municipal and Industrial Waste Conference," published by Department of Engineering Research, North Carolina State College, Raleigh, N C, Bulletin No 55, which relates to savings in sulfide by the use of our own Con-Mil Redox Method developed in 1941 for such studies.

Q: Neville: In regards to the problem of stream pollution, just how important a role does the detergent and wetting agent play? Are there factors that make the selection of detergent or soap for scouring of minor importance: or is this a major factor in itself? Also, is there any significant preference in rating the different types (e g, alkylarylpolyethers, fatty amine condensate, sulfated alcohols, alkylarylsulfonates) as to their effects on stream pollution?

Souther: The effect the different types of detergent might have on stream pollution could be a worthwhile field for future research. The amount and kind of detergent used in soaping and dyeing has been found important in our studies, namely, that alkylarylsulfonates and alkyarylpolyethers contribute practically no pollution to stream, sulfated alcohols a small amount of pollution, and fatty amine condensates a very high pollution, or B O D approaching that of chip soap.

Q, Welford: For most economical textile waste treatment, would you advocate preliminary treatment (coagulation, settlement) by the mill before discharge into municipal sewer, or should the raw waste be treated by city for increaesed fee? (Note: Mill waste equals in gallons/day the total amount of city sewage).

Souther: A study of the waste requiring treatment would have to be made to determine the most economical method for treating. Factors, such as nature of the waste, concentration, pH, and chemical composition, would have to be considered.

Q, Anderson: What complications arise from textile lint when combining mill waste with domestic sewage for treatment?

Souther: Some of the synthetics such as nylon can cause trouble in sewage-disposal plants by adhering to pump shafts.

Q: You mentioned redox methods for reducing amounts of sulfide in sulfur dyeing. Would you please give some data on amounts of sulfide necessary to dye sulfur blacks and other dark shades?

Souther: The amount of sulfide required to get good results on sulfur dyeings should be determined experimentally for each dye or combination of dyes used. For many years we have been using our redox method for finding best ratios, which are usually lower in sulfide than in published data. The redox method of evaluating dyebaths offers the most convenient method of determining the amounts of sulfides or other reducing chemicals required.

Q: What factor can be applied to oxygen in parts per million consumed according to the APHA permanganate method to give a quick test in terms of 5-day BOD on waste-effluent after treatment?

Stafford: The factor will vary with the type of waste tested, also with regard to which of the three APHA procedures for oxygen consumed is used. These procedures are for (1) normal sewage effluents and polluted waters, (2) brines or waters high in chloride and (3) strong sewage. The factor BOD/OC for most wastes is smaller with method 3 (N/8 $KMnO_4$) than with method 1 (N/80 $KMnO_4$).

The factor BOD/OC for the untreated combined wastes from a cotton and synthetic finishing plant was found to be 0.84-0.89 by methods 1 and 3. However, when individual process wastes were tested by either procedure, the factor varied considerably.

Reasons for the variation include the following: (a) Some wastes are bactericidal and inhibit the growth of bacteria in the BOD test; (b) nitrogenous organic matter is generally oxidized in the BOD test, but not so readily in the OC test; (c) some substances, as alcohols, are first oxidized by permangante to other compounds and then to carbon dioxide; and (d) some synthetic detergents, such as alkylarylsulfonates or ethylene oxide-alkylphenol derivatives have no BOD but give strong tests for oxygen consumed. The composition of a combined treated waste effluent would probably remain reasonably constant. Accordingly, it would be necessary first to determine the BOD/OC factor for the particular effluent by a selected procedure for oxygen consumed. Once the factor was obtained, it should be possible to estimate the BOD rather closely for control purposes by making an OC test and using the factor obtained by the preliminary determination.

Closing Address

E A LEONARD

IN closing I will summarize the points that have been brought out by this session:

1) The pipe lines of information are full and the AATCC is setting up taps and valves via the Stream-Pollution-Abatement Committees whereby this information can be made available to you, the textile industry.

2) We recommend that each mill study and know its own problem—define and analyze it. Few mills are aware as to whether or not they have a problem, and it would be a mistake to think that, because no authority is pressing on the matter, that a mill does not have a problem.

3) The nature and extent of the pollution problem having been ascertained, the following actions are in order:

a) First—establish process control for waste reduction at the source; it might even be possible to save some money.

b) Second—utilize waste products and by-products rather than dump them. Again, you might even save some money.

c) Third—know how the residue of unpreventable waste can be treated; and if it cannot be treated, determine what study is necessary to make it treatable. Let the AATCC Stream-Pollution Committee know about it; we might be able to get the answer from another industry via the NTTC or to sponsor the necessary research through committees.

Fourth Annual Summer Outing—Southeastern Section

June 19-20
Radium Springs, Georgia

THOSE attending the 4th Annual Outing of the Southeastern Section on June 19-20 at Radium Springs, Georgia, were favored with mild weather and a diversified program of events.

A bingo party highlighted the events on Friday, June 19 with many of the mills in the Section donating prizes. Friday also served as a "tune-up" day for golfers in preparation for the tournament on Saturday.

The ladies program began on Saturday afternoon with a luncheon, followed by bridge and canasta tournaments. Maxine Timmerman and Ann Myrick were the respective winners.

R H Dickinson took low gross honors in golf and Mrs Ira Hurd won a set of irons with low net, to the embarrassment of many males in the divot-dogging fraternity. W F Kennedy took top honors in horseshoes.

Saturday night activities included a cocktail party, banquet and dance. Prizes for winners of the various events were awarded at the dance.

Sunday morning those attending the outing were the guests of Radium Springs owner Horace Caldwell at an old-fashioned South Georgia breakfast (tomato juice, Southern fried chicken, fried ham, eggs, grits, gravy, hot biscuits and butter).

George Dozier and Francis Webster served as co-chairmen of the affair and were aided by the following committeemen: Louis Burkes, *Finance;* Jack Boykin, *Entertainment;* Tom Davis, *Ladies;* John Cook, *Registration;* Royce Smith, *Horseshoes;* Riley Jones, *Golf;* and Claude Suttles, *Photography.*

(Photos on next page)

1953 OUTING SOUTHEASTERN SECTION JUNE 19-20 RADIUM SPRINGS GA

A wee touch of Scotland

E Ravenel (Morton Salt)

Ira S Hurd (Warwick Chemical); Mrs Hurd; J W Swiney (Fulton Bag); W S Pearson (Crystal Springs Bleachery)

W F Kennedy (Arnold-Hoffman); J L Wyman (Nova Chemical); J K Boykin (National Aniline); M Ferguson (National Aniline); O O Scott, Jr (Union Mfg)

R K Federal (General Dyestuff); A Garrison (General Dyestuff); R M Jones (Southern States Chemical); R A Price (Pepperell Mfg)

R B Hallowell (Coats and Clark); K D Henry (Textile Aniline); G W Spicer (Textile Aniline); F S Webster (F H Ross)

Standing—H L Dozier (Adelaide Mills); W G Smith (Calco); R L Jones (Royce Chemical); J N Gammon (Nopco Chemical); J H Holmes (Nopco Chemical); A C Anderson (Calco). Seated—W E Fayssoux (Royce Chemical); Mrs Fayssoux; H I Bashlow (Coats and Clark); Mrs Dozier; Riley Jones (Dundee Mills)

S L Hayes (Ciba); Mrs R L Horney; R T Lindsey (Russell Mfg)

Photos by Claude Suttles, Southern States Chemical Company.

Northern New England Section ———

DYEING WOOL AT ELEVATED TEMPERATURES*

J J IANNARONE, H F CLAPHAM and R J THOMAS

Technical Laboratory, Organic Chemicals Department
E I du Pont de Nemours & Co, Inc

J J Iannarone

H F Clapham

R J Thomas

The success attained in dyeing the new synthetic fibers at temperatures above 212°F in commercial pressure machines has led to interest in the dyeing of wool at elevated temperatures. The authors have found from investigations carried out in both laboratory and mill that, in some cases, the dyeing cycle for the application of both level-dyeing and neutal-dyeing colors on carpet yarns can be shortened advantageously at 225°F. Various grades of wool stock and top can also be dyed effectively in a shorter time with chrome colors at that temperature.

INTRODUTION AND HISTORICAL BACKGROUND

THE blending of wool with the newer synthetic fibers, such as "Orlon" acrylic fiber and "Dacron" polyester fiber, is undergoing considerable experimentation by the woolen industry at the present time. Past experience has indicated that, in dyeing these synthetic fibers, temperatures above 212°F are essential to realize optimum color strength, improved fastness, shorter dyeing time and reduced dye and chemical costs *(1, 2)*. To meet these conditions, mills and equipment manufacturers converted existing machines and designed and built new ones for operation at higher temperatures. This departure from orthodox practice has proved universally successful for dyeing the newer synthetic fibers in commercial practice.

With this installation of high-temperature equipment, it was natural that attention be directed toward dyeing wool at elevated temperatures. The idea of dyeing wool at temperatures above 212°F is certainly not new. The continuous dyeing of fabrics of wool was patented by H J Walter of the Uxbridge Worsted Company *(3)*. Experimental work, subsequent to the concept of Walter, has been described in publications by his associates *(4, 5)*. The dyeing of wool at high temperatures was also included in a cooperative investigation by the Philadelphia Section of the AATCC *(6)*. Recent reports from Europe have indicated that elevated temperatures are being employed for dyeing wool on a mill scale *(7, 8)*.

The purpose of the present investigation was to determine to what degree high temperatures could be advantageously utilized in batch-dyeing wool stock, top and yarn in circulating equipment.

LABORATORY DYEING APPARATUS

A) GLASS "BOMBS"———Apparatus of the type illustrated in Figures 1 and 2 of the Philadelphia Section's intersectional contest paper on high-temperature dyeing *(6)* was employed for laboratory investigation because it permitted a considerable number of dyeings to be made with only a small quantity of material. In this equipment, glass pressure tubes or "bombs" are rotated end-over-end in a polyethylene glycol bath maintained at the desired temperature for dyeing. In the present study it was found preferable to eliminate the use of the "Teflon" tetrafluorethylene-resin form for holding skeins. The tubes are loaded with yarn and dye liquor at room temperature, sealed with a gasket made of "Teflon" and inserted in a metal shield. The metal shield is placed in a rotating arm in the polyethylene glycol bath, which is at a temperature of 80°F. Rotation is started, the temperature is raised over 30 minutes to that desired, and dyeing or treatment is continued for a required period. At the end of the dyeing cycle, the tubes are removed from the polyethylene glycol bath and cooled under running water.

B) CIRCULATING MACHINES——— A one-pound Smith-Drum machine and a two-pound Venango machine were converted to operate under pressure at elevated dyeing temperatures by the relatively minor changes indicated in the schematic drawing (Figure 1). These alterations consist of a safety valve set at 50 p s i g pressure and a gauge to indicate the pressure in the kier. Heat is furnished to the kier through closed steam coils. For pressure operation the expansion tank, in which only five per cent or less of the total liquor volume is present, is eliminated from the system by closing valves A and B. Additions of dyes and chemicals are made to the system through the expansion tank after cooling the contents of the kier to 200°F or less and opening valves A and B. After circulating the liquor through the

* Presented by R J Thomas before the Northern New England Section at Andover, Mass on May 15, 1953. The names "Capracyl," "Chromacyl," "Dacron," "Orlon," "Pontachrome," "Pontacyl" and "Teflon" are registered trade-marks of E. I du Pont de Nemours & Co, Inc.

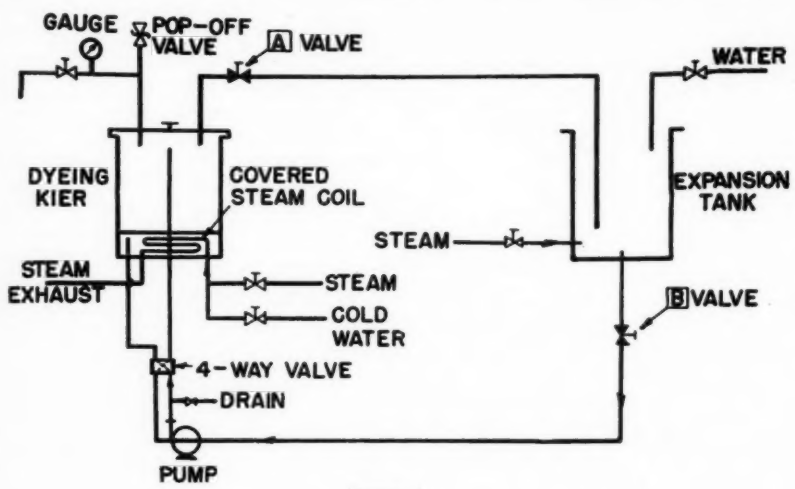


Figure 1
Circulating machine for high-temperature dyeing

expansion tank to disperse the added color or reagent throughout the system, valves A and B are again closed and the temperature increased.

EFFECT ON PHYSICAL PROPERTIES

It is to be expected that wool dyers might hesitate to dye or to treat wool at temperatures in excess of 212°F. In the work of Royer, et al *(4)* and of Robinson and Zimmerman *(5)*, attention was directed to the possibility of dyeing wool at temperatures substantially above 212°F for periods up to eight minutes, as would be encountered in continuous processing, without seriously affecting tensile strength. In the work of the Philadelphia Section *(6)*, it was concluded that the maximum safe conditions, from a commercially practical viewpoint for the batch dyeing of wool, are 250°F for 60 minutes at pH's of 2.0, 4.0 and 6.0. This conclusion was based on breaking-strength data of wool yarn. While these findings were encouraging, it was felt that the possibility of damage at elevated temperatures under various conditions of dyeing should be re-examined before initiating extensive experiments.

A) HAND KNITTING YARN—— To assure that no residual alkali remained in the 3/19's worsted yarn selected for this study, two pounds of yarn in two-gram-skein form was packed in the two-pound circulating machine and treated with

4.0% acetic acid, 56%

at 140°F for 40 minutes, rinsed thoroughly, centrifuged and dried in a warm-air dry box. The pH of the fiber after this treatment was 5.2.

The skeins were then treated for 10, 20, 40 and 60 minutes at 205-208, 225 and 250°F under conditions normally used in the trade for applying various types of acid dyes to wool, namely:

a) water only
b) 5.0% sodium sulfate, anhydrous
c) 4.0% acetic acid, 56%
   5.0% sodium sulfate, anhydrous
d) 4.0% formic acid, 87%
   5.0% sodium sulfate, anhydrous
e) 4.0% sulfuric acid, 66° Bé
   5.0% sodium sulfate, anhydrous

After treatment for the designated time and temperatures, the skeins were rinsed thoroughly and dried in a warm-air dry box. After being conditioned, the treated and untreated yarn and that which had been adjusted to a pH of 5.2 were subjected to thirteen breaks on the "Instron" tester. Both tensile strength and per cent elongation were noted. The results given in Table I are the averages of the thirteen breaks.

It is immediately apparent from these data that 250°F is a hazardous temperature for treating the material, even for a period of only ten minutes. This is particularly evident from an examination of the elongation data. It is noted further

TABLE I
EFFECT OF DYEING CONDITIONS ON PHYSICAL PROPERTIES OF 3/19's WORSTED YARN

Tensile Strength, Pounds

	A			B			C			D			E		
	Water only			5% Na_2SO_4			5% Na_2SO_4 4% CH_3COOH (56%)			5% Na_2SO_4 4% HCOOH (87%)			5% Na_2SO_4 4% H_2SO_4		
	Temp, °F			Temp, °F			Temp, °F			Temp, °F			Temp, °F		
Minutes	205	225	250	205	225	250	205	225	250	205	225	250	205	225	250
10	2.73	2.54	2.34	2.48	2.78	2.36	2.69	2.84	2.47	2.70	2.69	2.45	2.61	2.80	2.21
20	2.53	2.66	2.08	2.61	2.70	2.25	2.62	2.48	2.26	2.65	2.72	2.40	2.64	2.60	2.00
40	2.62	2.66	1.84	2.54	2.64	1.97	2.60	2.73	2.23	2.69	2.77	2.22	2.52	2.50	1.49
60	2.50	2.65	1.69	2.40	2.58	1.77	2.66	2.67	2.12	2.67	2.67	2.05	2.73	2.55	1.27

Elongation, %

	A			B			C			D			E		
	Water only			5% Na_2SO_4			5% Na_2SO_4 4% CH_3COOH (56%)			5% Na_2SO_4 4% HCOOH (87%)			5% Na_2SO_4 4% H_2SO_4		
	Temp, °F			Temp, °F			Temp, °F			Temp, °F			Temp, °F		
Minutes	205	225	250	205	225	250	205	225	250	205	225	250	205	225	250
10	47.2	39.9	38.8	45.2	38.0	34.2	45.3	35.4	39.0	49.5	45.1	38.6	46.5	44.9	27.6
20	51.1	34.5	28.5	46.6	37.2	28.8	48.1	44.3	36.6	46.9	46.3	34.6	44.6	45.4	26.0
40	52.0	37.5	19.4	45.1	35.8	25.6	41.8	42.9	33.2	50.8	46.2	27.0	43.7	41.3	24.0
60	47.2	36.0	20.1	45.8	34.0	22.0	43.4	46.5	30.0	49.2	43.4	24.6	40.6	40.7	20.0

Control

	Tensile Strength (pounds)	Elongation (%)
Untreated	2.75	46.8
Neutralized to pH 5.2	2.79	40.9

TABLE II

EFFECT OF DYEING CONDITIONS ON PHYSICAL PROPERTIES OF 42/3's CARPET YARN

	Tensile Strength pounds		Elongation per cent	
	Average	Range	Average	Range
Oil Yarn	8.91	8.0-10.2	41.3	34-48
Scoured	7.65	6.6- 8.5	42.1	32-47
*Dyed 212 °F	5.4	4.6- 6.4	17.7	14-23.5
Series A (Dyed at pH 4.8)				
225° F 20 minutes	6.13	5.2- 6.8	28.3	25-38
225° F 40 minutes	5.66	4.8- 6.4	27.2	19-31
250° F 20 minutes	5.05	4.4- 6.0	22.9	17-35
250° F 40 minutes	4.13	3.5- 4.8	18.9	16-22
Series B (Dyed at pH 6.2)				
225° F 10 minutes	6.4	5.4- 7.0	31	23-38
225° F 20 minutes	5.6	4.8- 7.0	26	20-31
225° F 40 minutes	5.5	5.0- 6.6	27	22-38

* Average of five kettles of yarn dyed under normal conditions at pH 4.8.

that the loss in strength or in elongation is more pronounced as the conditions of treatment digress from the isoelectric point of wool. In other words, treating conditions C and D are most favorable, although at 225°F for periods up to one hour any of the treatments can be used without causing a serious loss in tensile strength. It is noted, however, that at 225°F in essentially neutral dyebaths, there is a noticeable loss in the elongation.

B) CARPET YARN ——— Physical data were also ascertained on a 42/3's high-twist carpet yarn which had been scoured by conventional mill processing and then dyed in a two-pound circulating machine at pH 4.8 with a combination of level-dyeing acid colors and at pH 6.2 with a combination of neutral-dyeing colors. The level-dyeing colors were applied for both 20 and 40 minutes at 225 and 250°F. The neutral-dyeing colors were applied for 10, 20 and 40 minutes at 225°F. After conditioning at 70°F and 65 per cent relative humidity, a series of breaks was made on the "Instron" tester. The average tensile strength and per cent elongation values appear in Table II. Similar data on "oil" yarn, scoured yarn, and yarn mill-dyed at 212°F by conventional dyeing processes are included. The figures for the mill-dyed yarn were averaged from breaks made on material selected from five kettles in which dyeing was accomplished under normal conditions at pH 4.8.

It is apparent from these data that a temperature of 250°F represents a hazardous condition for batch-dyeing wool. On the other hand, at a temperature of 225°F for 40 minutes, wool of higher tensile strength and higher per cent elongation is obtained than from conventional dyeing operations at 212°F. It should be kept in mind that conventional dyeing at 212°F necessitates dyeing cycles of three to five hours to obtain adequate penetration and levelness.

From the physical data described in Section A it is concluded that wool, with the quality represented by the hand-knitting yarns described, can be dyed at 225°F for periods up to one hour without causing significant damage. Carpet yarns can be dyed at 225°F for as much as 40 minutes or possibly longer and will result in better-quality material than that obtained from conventional longer-period dyeings at the boil.

LABORATORY DYEING STUDIES

A) STABILITY OF DYES———Previous investigators *(6)* found that most acid dyes exhibited good stability when subjected, in the absence of the fiber, to temperatures above 225°F for 60 minutes. In this investigation, the effect of dyeing temperatures on the stability of dyes was not ascertained quantitatively, but it was observed that strengths of the dyeings obtained at 225°F were generally equal or superior to those obtained with the same dyes at the boil.

B) RATE OF EXHAUSTION———In the production of light shades with level-dyeing colors, the dye was substantially exhausted from the bath by the time the dyeing temperature reached 200°F, provided a sufficiently low pH was maintained in the bath. Similar to dyeing at the boil, high-temperature application requires a low pH to obtain efficient exhaustion of level-dyeing colors. This is evident from Figure 2 in which the rate of exhaustion for "Pontaycl" Light Red BLX (Pr 101) is graphically presented. These data were derived from baths containing no acid (Method B) and from baths acidified with sulfuric acid (Method E). In Table III, additional data are presented which indicate the variation in exhaust rates which occur in dyeing with different acids from baths at 205-208°F and 225°F.

Unlike the level-dyeing acid dyes, the neutral-dyeing colors exhausted well on the yarn which had been acid washed whether or not any additional acid was incorporated in the bath. However, the exhaustion rate for many of the dyes in this class was substantially slower when they were applied without acetic acid. An example of this is illustrated in the rate-of-exhaustion graph for Du Pont Anthraquinone Green GN (C I 1078). Exhaustion of the "Capracyl" dyes, applied at 0.5 p.r

TABLE III

EFFECT OF ACIDITY AND TEMPERATURE ON EXHAUSTION OF LEVEL-DYEING COLORS

		% Exhaustion					
		5% Na_2SO_4 (pH = 5.9)		2% CH_3COOH (56%) 5% Na_2SO_4 (pH = 5.3)		2% H_2SO_4 5% Na_2SO_4 (pH = 2.8)	
2.0% Dyeing*	C I	205-208°F	225°F	205-208°F	225°F	205-208°F	225°F
Pontacyl Light Yellow 3G Conc 150%	636	34.5	32.0	81.5	73.0	99.2	96.2
Pontacyl Light Yellow GX	639	29.5	26.0	68.8	61.6	97.5	97.8
Pontacyl Ruby PL Extra Conc 200%	—	81.9	77.2	95.8	94.2	96.1	98.6
Pontacyl Light Red BLX	Pr 101	32.5	33.5	76.8	74.6	98.9	99.4
Pontacyl Carmine 2G Conc 150%	31	38.0	24.5	72.8	66.0	95.4	98.1
Pontacyl Fast Violet 10B Conc 175%	596	50.7	48.5	75.6	74.8	84.4	91.5
Pontacyl Violet 4BSN Conc 125%	53	34.5	29.5	77.6	75.8	97.7	97.0

* Raised to dyeing temperature in 30 minutes,
(a) dyed at 205-208°F for 60 minutes,
(b) dyed at 225°F for 40 minutes.

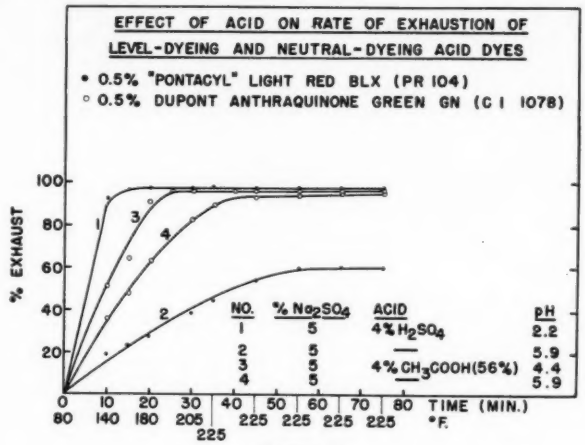

EFFECT OF ACID ON RATE OF EXHAUSTION OF
LEVEL-DYEING AND NEUTRAL-DYEING ACID DYES
• 0.5% "PONTACYL" LIGHT RED BLX (PR 104)
○ 0.5% DUPONT ANTHRAQUINONE GREEN GN (C I 1078)
% EXHAUST
NO. % Na2SO4 ACID pH
1 5 4% H2SO4 2.2
2 5 — 5.9
3 5 4% CH3COOH(56%) 4.4
4 5 5.9
TIME (MIN.)
°F

Figure 2

cent, proceeds gradually as the temperature of the dyebath is increased and is substantially complete at 205-208°F or 225°F. "Chromacyl" dyes applied with either formic or sulfuric acid similarly exhibit complete exhaustion.

C) LEVELING———In the Philadelphia Section's investigation *(6)* the transfer of dyes at 250°F was evaluated and reported to be rapid. Drijvers *(7)* stated that acid dyes with very poor leveling power gave level dyeings on cross-wound bobbins after a few minutes' dyeing, presumably at 230-239°F. He reported further that even those dyes with a known poor levelness rating could be used for shading without special precautions.

In the current studies the leveling properties of various classes of wool dyes were investigated. To accomplish this, two one-gram skeins of 3/19's yarn were dyed by the procedures described below:

(1) level-dyeing types: dyed with 4.0% sulfuric acid
  (a) for 60 minutes at 205-208°F;
  (b) for 40 minutes at 225°F;
  Pontacyl Light Yellow 3G Conc 150%
  Pontacyl Light Yellow GX
  Pontacyl Ruby PL Extra Conc 200%
  Pontacyl Carmine 2G Cone 150%
  Pontacyl Brilliant Blue V
  Pontacyl Violet 4BSN Cone 125%
  Pontacyl Fast Violet 10B Conc 175%

(2) milling and chrome types:
  dyed with 2.0% acetic acid, 56%
  (a) for 60 minutesat 205-208°F;
  (b) for 40 minutes at 225° F:
  Du Pont Milling Yellow R Conc
  Du Pont Milling Orange R Conc
  Du Pont Milling Red R Conc
  Du Pont Milling Red SWG Conc 125%
  Du Pont Anthraquinone Violet 3RN
  Pontacyl Wool Blue BL Conc 200%
  Du Pont Anthraquinone Milling Blue BL
  Du Pont Brilliant Milling Green B Conc
  Du Pont Anthraquinone Green GN
  Pontachrome Yellow SW Conc 150%
  Pontachrome Orange RL
  Pontachrome Brown G
  Pontachrome Brown HN Conc
  Pontachrome Black TA

(3) Capracyl dyes: dyed with 10% ammonium acetate
  (a) for 45 minutes at 205-208°F;
  (b) for 40 minutes at 225°F.
  The dyes of this class that were evaluated appear in Table IV.

(4) Chromacyl dyes:
  dyed with 6.0% sulfuric acid for 40 and for 90 minutes at 205-208°F and for 40 minutes at 225°F;
  dyed with 4.0% formic acid, 87%, for 40 and for 90 minutes at 205-208° and for 40 minutes at 225°F.
  The dyes of this class that were evaluated are listed in Table V.

After being dyed, the skeins were rinsed and dried. A dyed skein and an undyed skein were then placed in a tube with a blank dyebath, ie, as described above but without the addition of dye. The temperature was raised from 90 to 205-208 or to 225°F in 30 minutes. Transfer was permitted to continue for varying times, the skeins were removed, rinsed and rated visually as to the degree of dye migration.

In general, those dyes possessing good leveling properties at 205-208°F were equally good or better at 225°F. Included in this category are the level-dyeing types which transfer well at both temperatures. On the other hand, milling dyes which showed poor transfer at 205-208°F exhibited only an insignificant improvement at 225°F. An exception to this is Du Pont Brilliant Milling Green B Conc, which transferred relatively well at the elevated temperature. It is possible that further evaluation may uncover other milling dyes which, like the Du Pont Brilliant Milling Green B Conc, will exhibit improved transfer at elevated temperatures.

In regard to the "Capracyl" dyes, which were reported by Clapham *(9)* to transfer to only a relatively low degree at the boil, it was observed that at 225°F leveling was much improved. Relative transfer ratings for dyes of this class appear in Table IV. Other experiments indicated that 20 minutes at 225°F yielded the same degree of leveling as that obtained in 45 minutes at 205-208°F. The "Chromacyl" dyes also showed better transfer at elevated temperatures, as is evident from the ratings in Table V. Most "Chromacyl" dyes depend upon sulfuric acid to promote transfer *(10)*. This is likewise true at 225°F, as is apparent from the data in Table V, which show that transfer is not especially effective even at 225°F with formic acid.

In general, those chrome dyes examined showed (before chroming) improved leveling at 225°F as compared with 205-208°F.

MILL DYEING

In the laboratory dyeing of many shades on a number of wool items, little advantage resulted from the use of elevated

TABLE IV

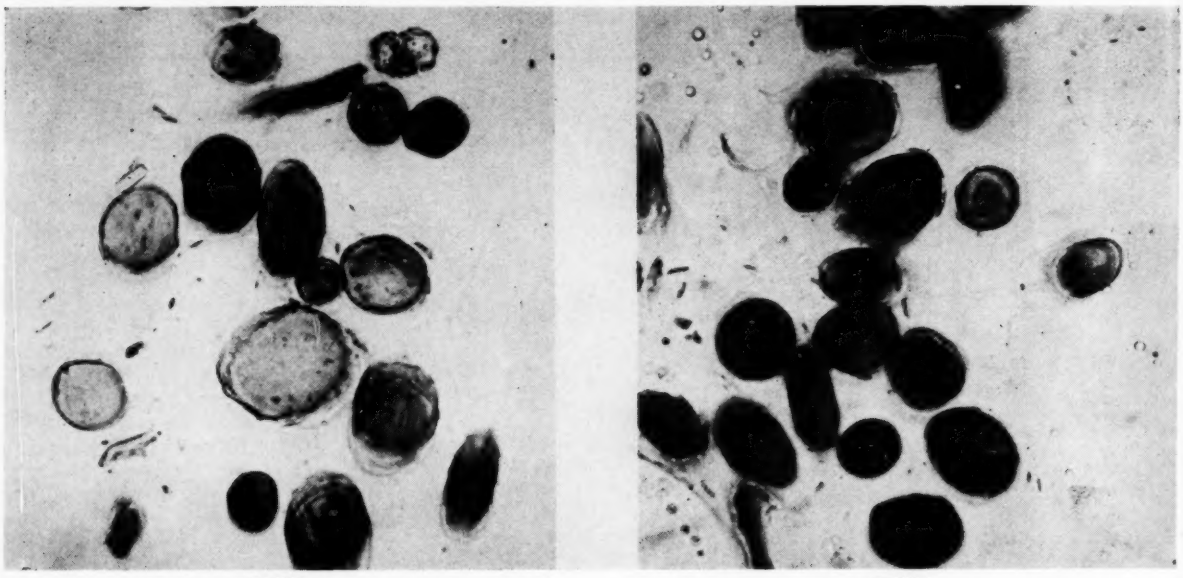
EFFECT OF TEMPERATURE ON RELATIVE TRANSFER OF CAPRACYL DYES

	Degree of Transfer, %	
2.0% Dyeing	*45 minutes at 205°F*	*40 minutes at 225°F*
Capracyl Yellow NW	50	100
Capracyl Yellow 3RD	30	90
Capracyl Orange R	30	80
Capracyl Red B	30	50
Capracyl Red BB	10	40
Capracyl Gray GN	10	25

TABLE V

EFFECT OF TEMPERATURE ON RELATIVE TRANSFER OF CHROMACYL DYES

	205-208°F				*225°F*	
	6% H_2SO_4		*4% HCOOH (87%)*		*6% H_2SO_4*	*4% HCOOH (87%)*
Dyeing—minutes	*40*	*90*	*40*	*90*	*40*	*40*
%						
2.0 Chromacyl Yellow N	10	20			30	20
2.0 Chromacyl Orange R	25	50			80	40
2.0 Chromacyl Brilliant Pink 3B	80	90	5	10	90	10
2.0 Chromacyl Blue GG Conc 200%	75	90	<5	<5	100	<5
7.0 Chromacyl Black W	<5	<5	<5	<5	<5	<5



205°F 225°F

Figure 3
Mill Dyeing—600 lb rawstock

		No. of Minutes	
		(205°F)	(225°F)
0.85% "Pontachrome" Brown HN Conc.	Heat up	45	75
0.95% "Pontachrome" Fast Red E Conc.	Dye	75	15
3.0% acetic acid (56%).			
1.0% sodium dichromate.	Chrome	30	15
	Total	150	105

temperatures. The most attractive applications for high-temperature batch methods appeared where long dyeing cycles were involved. Application of heavy shades with chrome colors to rawstock and top and the application of level-dyeing and neutral types to carpet yarns was also conducted in mill equipment. In both approaches, encouraging results were obtained.

From the scientific standpoint it would be desirable to report that analogous experiments were conducted in mill equipment at the boil and at 225°F, but time and expense have permitted only a partial fulfillment of this. However, it is possible to point to the wide commercial experience which has dictated that dyeing at the boil be carried out for considerably longer periods than were found necessary in the work reported below in dyeing at 225°F.

A) CARPET YARNS———Inasmuch as it is necessary that certain types of carpet yarns be relaxed during dyeing, they could not be wound on spindles and dyed at elevated temperatures in the same manner used for synthetic yarns. Because of this, the high-twist yarn in skein form was placed in a basket and inserted in a 100-pound Smith-Drum circulating machine. During all dyeing cycles, two-way flow (three minutes outside-in and two minutes inside-out) was used.

1) *Level Dyeing Colors*———A formulation normally used to produce a green shade with a dyeing cycle of three to six hours at the boil was employed to dye 100 pounds of 42/3's yarn. Ten pounds of anhydrous sodium sulfate were added to the bath and the pH adjusted to 4.65 by the addition of five pounds of acetic acid, 56 per cent; the following dyes were added:

0.125% Pontacyl Light Yellow GX (C I 639),
0.050% Du Pont Orange G (C I 27) and
0.375% Du Pont Anthraquinone Blue 2GA

and the temperature was raised to 225°F in 30 minutes and maintained for 40 minutes. At the end of this time the pH was 4.75. The bath was dropped, skeins were removed, centrifuged and dried. Inspection of the yarn showed penetration to be good and levelness satisfactory. This yarn was fabricated into a carpet, which, in texture and appearance, was the equal of carpets similarly constructed from yarn dyed by the normal methods.

2) *Neutral Dyeing Colors*———Ordinarily, neutral-dyeing types cannot be satisfactorily employed in the dyeing of carpet yarn at the boil. However, it was thought that at the elevated temperature the imperfections encountered in the use of these types at the boil would be avoided and a dyeing with superior fastness to that ordinarily obtained with level-dyeing types would result. Accordingly, previously scoured skeins of 42/3's yarn, weighing 100 pounds, were wet out at 140-145°F. One quart of acetic acid, 56 per cent, was added to adjust the pH to 6.2. A combination of

0.039% Du Pont Milling Yellow 5G Conc (C I 642),
0.184% Du Pont Neutral Brown BGL and
0.226% Du Pont Anthraquinone Green GN (C I 1078)

was applied. Dyeing was carried out as in the case of the level-dyeing colors.

Again the yarn was well penetrated and levelness was satisfactory. This yarn was also made into a carpet that was equal in texture and appearance to carpets similarly constructed from yarns dyed in the conventional manner with level-dyeing colors.

In another mill trial, an attempt to shade a gray dyeing by addition of Du Pont Anthraquinone Milling Blue BL at 190°F and subsequent heating to and continuation of dyeing at 225°F resulted in uneven deposition of this component, as would be predicted from the above work on leveling but would not be anticipated in view of the statements of Drijvers *(7)*.

B) RAWSTOCK AND TOP———In the initial mill-scale dyeing of rawstock, a 500-pound lot of virgin, scoured Australian wool was placed in a Morton stock-dyeing machine. After wetting out,

4.0% acetic acid, 56%, and
10.0% Diamond Black P2B (Pr 375)

were added. The following cycle was employed:

Raised temperature to 212°F in 30 minutes, ran 20 minutes, then added
2.0% formic acid, 85%,
ran 10 minutes, raised temperature to 225°F and dyed for 20 minutes. Cooled to 190°F, added
1.5% sodium dichromate
and heated to 225°F.
Chromed at this temperature for 20 minutes. Cooled to 190°F and washed.

The dyeing was perfectly level and equal to the regular top-chromed boil dyeings in fastness to fulling and cross-dyeing. The over-all cycle required one-half the time of the regular boil dyeing, which was unusually long because it called for a double chroming.

In a second run, a lot of reworked wool was selected to be dyed a brown shade. Six hundred pounds of the stock were placed in a Riggs and Lombard machine. Before dyeing, it was stripped and neutralized. Then, at 100°F, there were added

3.0% acetic acid, 56%,
0.85% Pontachrome Brown HN Conc (C I 98) and
0.95% Pontachrome Fast Red E Conc (C I 652).

The temperature was brought to 225°F in 75 minutes, dyeing was continued at 225°F for 15 minutes, then at 225°F. 1.0 per cent sodium dichromate was added and chroming carried out at 225°F for 15 minutes, after which the stock was washed.

Tests carried out on the dyed stock showed it to have noticeably improved levelness and fastness to washing as compared with similar stock dyed at the boil in the normal manner. As indicated in Figure 3, fiber penetration was superior in the dyeing made at 225°F.

Dyeings were also carried out on 300 pounds of top in a Riggs and Lombard machine to a black shade with 7.0 per cent "Pontachrome" Black TA (C I 203). In this case, the bath was raised to 225°F in approximately one hour, dyeing was carried out at 225°F for 15 minutes, 1.0 per cent sodium dichromate was added and chroming was carried out for 15 minutes at 225°F. The top was then rinsed and dried. Not only was the dyeing of good levelness, but the top itself was in excellent condition. This dyeing represented a saving of over one hour as compared with the regular procedure.

Up to this time the described procedure has not been evaluated on a mill scale on other animal fibers. However, laboratory dyeings were made in a two-pound circulating machine on cashmere, camel's hair and a very high-grade wool, respectively. Examination of the dyed materials by a chemist from a firm regularly processing these fibers elicited the opinion that an outstanding dyeing had been accomplished.

CONCLUSION

This paper particularly emphasizes the fact that wool, in many cases, can be advantageously dyed at elevated temperatures. It is also recognized that there is no advantage in using higher temperatures for certain shades on some items. However, at 225°F carpet yarns have been dyed in much shorter cycles with both level- and neutral-dyeing colors. Various grades of stock, as well as top, have been dyed with chrome colors in shorter cycles than those normally employed at the boil. In view of the economics involved, especially where long dyeing cycles are employed, it is recommended that dyers consider using a temperature of 225° in pressurized equipment.

ACKNOWLEDGMENT

The authors express their sincere thanks to Harry L Morgan of James Lees & Sons Company for his co-operation in conducting mill dyeings on carpet yarns and in testing dyed carpet yarns and to T P Seney of Daniel E Cummings Company for his co-operation in conducting mill dyeings on rawstock.

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NOTICE TO DYE MANUFACTURERS

THE Tabulation of American Dyes has been completely revised for the 1953 Technical Manual and Year Book. It will not have another complete revision until 1955. However, there will be an opportunity in the 1954 edition for the correction of any errors that may be discovered, and for any changes in C I or Pr numbers that may be requested. Communications regarding such corrections and changes should be sent to the undersigned not later than January 1, 1954. It is not planned to add any new dyes at this time.

William H Cady
Editor, Technical Manual and Year Book
127 Power Street
Providence 6, Rhode Island

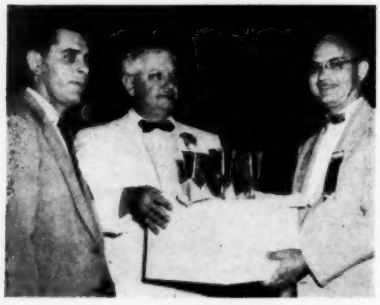
Approximately 185 Attend South Central Outing

THE Annual Outing of the South Central Section, held at the Chattanooga Golf & Country Club, August 21-22, attracted approximately 185 members and guests. The affair opened with the first round of the golf tournament on Friday, followed by a buffet supper, bingo party and dance Friday evening. The golf tournament continued Saturday along with a casting meet and horseshoe pitching tournament for the men. For the ladies there was a luncheon at noon followed by bridge and canasta. On Saturday evening the Annual Banquet and Dance was preceded by a cocktail party. Prizes to the winners in the various contests as well as many door prizes were awarded at the banquet.

E F Jurczak, Burkart-Schier Chemical Company, was general chairman of the Outing and Jack Anderson of Peerless Textiles Inc, vice-chairman. Others serving on the Outing Committee were E E Burgner, Jr, Davenport Hosiery Mills; Howard Loveless, Jr, Crystal Springs Bleachery; P R Williams, Jr, Du Pont; E V Helms, Geigy Co; L Madaris, Mar-Mode Hosiery Mills; I Payne, Jr, of General Dyestuff Corporation; J C Whitt, Standard-Coosa-Thatcher Company and Mrs E E Burgner, Jr (in charge of the ladies portion of the program).

Fletcher Kibler, Morningside Chemical Company, was awarded the cup which is held until the following year by the golfer with the lowest gross score. The large cup, which must be won three times in succession to be retained permanently, was first awarded in 1952 to Dan Rion, National Oil Products Co.

(Photos on Page P672)



Grover Eaves, Cloverdale Manufacturing Co, (right) receives the award for low gross —millmen from Assistant Outing Chairman Jack Anderson, Peerless Textiles, Inc (center) and Outing Chairman Edwin Jurczak, Burkart-Schier Chemical Co

ANNUAL OUTING

South Central

Section

Chattanooga Golf

and Country Club

August 21-22

(L to r): Homer Whelchel (Central Franklin Process); William Luther (Dixie Mercerizing); Fowler Jackson (Laurel Soap Mfg); and Oscar Masingill (Central Franklin Process)

Fletcher Kibler, Morningside Chemical Co, (left) is presented with the low gross trophy by Outing Chairman Edwin Jurczak

Head Table, Saturday Night Banquet
Standing, l to r: Glenn Bellamy, Mrs Bellamy, Paul Anderson, Mrs Anderson, S L Hayes, Joe Bohannon, Mrs Bohannon, Mrs William Luther, William Luther
Seated, l to r: Mrs Everett Burgner, Everett Burgner, Mrs Jack Anderson, Jack Anderson, Edwin Jurczak, Howard Loveless, Mrs Loveless

(Seated around table, l to r): Mrs. Walter Motter; Mrs Fletcher Kibler; Andrew J Kelly (Burkhart-Schier Chemical Co); Mrs George Wellworth; George Wellworth; Walter Motter; E V Helms (Geigy Co, Inc); Mrs Helms; Fletcher Kibler

(L to r): Mrs Charles A Spratt; Everett Burgner (Davenport Hosiery Mills); Mrs Burgner; Mrs Jack Anderson; Jack Anderson

Book Reviews

PRECIS DE TEINTURE DES FIBRES TEXILES—2nd Edition

Maurice Robinet
Editions Teintex
Paris (1951)
741 pages

The entire field of dyeing is covered by the author in a remarkable manner. Although the coverage is not detailed, it is very broad. Color, color measurement, theory of dyeing, dyeing of the various classes, dye manufacture, printing, wet finishing and dyeing machinery are all subjects of discussion in the book. Thus, neither theory nor practice are neglected.

On the whole the book is very up-to-date, treating such recent subjects as Orlon, Terylene, and the molten-metal process. The chapter on theory of dyeing is perhaps the most out-of-date, and although some references are made to modern work, the chapter does not adequately discuss present knowledge.

The author apparently has treated the classification of dyes from the chemical point of view; acid, direct cotton, mordant and premetallized dyes are all dealt with in one chapter, and dyes produced on the fiber (aniline and azoic) are differentiated from those regenerated in the fiber (vats) in other chapters.

A very excellent chapter of 116 pages is given on the subject of color and color measurement.

The book is suitable as a textbook of dyeing, and due to its wide coverage, should be useful to anyone with a reading knowledge of French.—RJP

POLAROGRAPHY (Volume I) 2nd Edition

I M Kolthoff and James J Lingane
Interscience Publishers, Inc
250 Fifth Ave, New York 1, N Y
$9.00; 420 pages

The polarographic method of chemical analysis has developed so rapidly since its introduction in 1920 that it has become increasingly difficult for the chemist to keep abreast of the advances in both factual knowledge and theoretical interpretation. The authors of this text have completed a ponderous task of correlating and systematizing the theoretical principles and practical applications of polarographic analysis in this revised, reorganized, and expanded edition.

This Volume is divided into two parts: Part One contains fifteen chapters on the theoretical principles of polarography, and Part Two comprises four chapters on the latest instrumentation and techniques with a number of illustrations to assist the analyst.

This volume is excellent in every detail and should prove an outstanding aid to the analytical chemist.—EPJ

POLAROGRAPHY (Volume II)

I M Kolthoff and James J Lingane
Interscience Publishers, Inc
250 Fifth Ave, New York 1, N Y (1952)
$11.00; xx and 567 pages

Volume two of this series supplements Part One, which discusses the theory of polarography and deals with instrumentation and methods. The preface states that "Volume II is concerned with practical applications in inorganic, organic, and biological chemistry, and with amperometric titrations."

The first seventeen chapters of the volume deal with the inorganic elements. Each element is discussed in general and in some of the forms in which it appears commercially. For example, after two pages of general discussion of lead, application of polarography to lead in alloys, in smelter products, in natural waters, in insecticides, in TEL in gasoline, in paints, in foodstuffs, and in physiological products are all discussed.

Twelve chapters are devoted to the application of the polarographic technique to organic chemistry, and two to the applications of polarography in biology. The last two chapters are devoted to amperometric titrations.

The bibliography is complete, the references being placed conveniently at the bottom of the page where the reference is made.

The two volume of this series will undoubtedly become the standard reference work on polarography.—WGC

AMERICAN HANDBOOK OF SYNTHETIC TEXTILES

H R Mauersberger, et al
Textile Book Publishers, Inc
New York (1952); $10.80
1218 pages; 430 tables, charts and flow sheets

The new synthetics handbook now joins its revised relatives—*The American Wool Handbook* and *The American Cotton Handbook*—on the bookshelves; and like its predecessors, it presents nicely the practical aspects of the field in its twenty chapters.

Chapters 3, 4, 5, 6, 14, 15, 16, 17 and 19 may be cited as being of particular interest to textile chemists. Chapters 3-6 are devoted to descriptive material on fiber manufacture: the rayons, nylon, and synthetics other than nylon, e g, dynel, Orlon, Dacron, X-51, Acrilon, Vicara, and glass. Although necessarily brief, the information found in these chapters is a useful survey. Information about the fibers' heat resistance, chemical resistance, solvents etc, is quite complete. The fact that some of this information was obtained directly from a given manufacturer is duly noted.

A substantial number of pages of advertising are included in the book. Most of these pages are at the back and the front of the book, but a few are interspersed among the pages of text. It is annoying to find a double page of advertising (pp 157, 158, chapter 4) so inserted, particularly so when the price of the book is considered.

Chapters 14 and 15 are written by A R Macormac and are given to dyeing, dye testing, and dye nomenclature. General dyeing methods and formulations are presented, and an excellent bibliography is included in chapter 14. Chapter 15 consists of a number of useful tables. For example, table 10 lists 17 specific dyes for nylon that are fast to hydrosulfite; table 12 lists a large number of specific acid dyes for dynel.

Chapter 16 is devoted to printing of synthetic piece goods; chapter 17 covers fabric finishing and is quite up-to-date. This chapter also includes an extensive and useful bibliography. Chapter 19 is written by A N J Heyn of Clemson College and is devoted to "Synthetic Fiber Identification by X-ray Diffraction." For those who would get some insight to the methodology of the X-ray technologist, this chapter is highly recommended.

The utility of this handbook is great, for it has managed to include some information on all the new fibers that are on the immediate horizon. The scope of the text is confined to American synthetic fibers and American practise. So much diverse, useful, practical information about synthetic fibers is nowhere else available in one source, hence this handbook is certain to be popular. It is a well-written, well-indexed, valuable reference work for chemists, engineers, and manufacturers.—JBM

WAX CHEMISTRY AND TECHNOLOGY

L Ivanovsky
London and Bridgend
68 Park St, Bridgend, England
43 pages; paper bound

This monograph was first published as a paper in four installments in the October, 1951 and subsequent issues of *Soap, Perfumery and Cosmetics*. It represents a compact survey of the basic principles of the chemistry, chemical physics, and analysis of waxes and provides a list of selected references to facilitate a more complete study of this vast field.

Part One includes a discussion of the history, definition, origin, chemical classification, production, uses, and functions of waxes. Part Two covers wax chemistry, physics, and analysis, and Part Three is devoted to specific, individual waxes in the classification tables.

This monograph is well written and should prove useful to the chemist who desires a compact study of an otherwise time-consuming subject.—EPJ

PROGRÉS RÉALISÉS DANS LE DOMAINE DE LA TECHNOLOGIE CHIMIQUE DES TEXTILES PREMIERE PARTIE

Progrés réalisés dans l'application des matieres colorantes Volume I—2nd revised Edition

Louis Diserens
Editions Teintex
Paris, France (1950)
573 pages

This book, the first volume of the second French edition, which will eventually consist of four volumes, covers the dyeing and printing of vat, soluble vat and sulfur dyes. The treatise is very well up-to-date, covering progress made in dyeing and printing through the end of 1949.

This is the most recent of a fine series of books by Dr Diserens now available in English, German and French. The style of this volume is very similar to the English translation of an earlier German edition but the coverage is more up-to-date. (A review of the English translation by P Wengraf and H P Baumann was published in *Am Dyestuff Reptr 41*, 373 (1952)).

Dr Diserens has maintained the high quality of his previous works and thus the dyer who reads French will find this volume a very useful reference.

The quality of the binding, the paper and the printing are considerably inferior to the English volumes.—RJP

PULP AND PAPER CHEMISTRY AND CHEMICAL TECHNOLOGY

Volume II—Properties of Paper and Converting

James P Casey
Interscience Publishers, Inc
250 Fifth Avenue, New York 1, N Y (1952)
$15.00; xvii and 608 pages

This volume continues the treatment of paper topics begun in Volume I. Paper testing, from the standpoints of physical, optical, chemical, electrical and microscopical properties, is first considered, and is followed by chapters on the use of statistics, pigment coating, printing, laminating and pasting, internal treatment of paper with resinous materials, coating with resinous materials and resins. Under these headings, a great amount of information has been brought together in one volume and will serve a useful purpose to textile paper chemists. Many of the resins, described somewhat sketchily in the last chapter, find both textile and paper applications, while some coating methods are also common to the two industries. For these reasons, the book is to be recommended to those textile chemists interested in following the progress of a sister industry.

While reading a reference book of this type, one cannot fail to be impressed by the number of fields touched upon by a single industry, such as papermaking. Electron microscopy, statistics, microbiology, organic chemistry, dyestuff chemistry, optics, etc, etc; some knowledge of all these topics is essential to the technician in the industry today. To supply this need, at least in part, is the purpose of this book and it appears to have succeeded admirably.

Printing and paper are improved over Volume I, but still leave something to be desired.

COLOR IN BUSINESS, SCIENCE AND INDUSTRY

Deane B Judd
John Wiley & Sons, Inc
440 Fourth Ave, New York 16, N Y
$6.50

This is a book for which the need has long existed. Authoritative, readable and informative, it gives a clear statement of the science of color and its application to industrial problems. In his preface, Dr Judd, now Chief of the Colorimetry Unit of the National Bureau of Standards, states his thesis thusly:

"I can make no claim of intimate knowledge of all, or even most, of the color problems arising in industry. It has been my privilege, however, in my twenty years at the National Bureau of Standards, to come into contact with hundreds of colorimetric sore spots in our industrial life. I have seen victories that paid off in dollars and cents won by applying the sciences of mathematics, physics, and psychology to these problems. In particular, a whole new science has been developed, largely since the turn of the century, applying to many of these color problems. This is the science of visual psychophysics. The key to color problems of the future is to be found in visual psychophysics mixed with a liberal sprinkling of common sense. This book is an attempt to present visual psychophysics in terms that are practically useful."

In three parts—Basic Facts, Tools and Techniques, and Physics and Psychophysics of Colorant Layers—topics such as the basic facts of vision, color mixing, instruments, colorimetry, color scales, color tolerances, gloss, opacity, etc are taken up with their applications to specific problems. The Appendix contains a useful set of tables for workers in the field.

In the section on color standards, the standard and seasonal color cards issued by the Textile Color Card Association of the United States, Inc, receive mention as do the United States Army Color Card and Standards for Grade of Raw Cotton. Color standards of all industries are mentioned and considered in relation to the basic standards.

This book is a must for the textile chemist or physicist seriously concerned with color and its attendant problems.

TECHNICAL CO-OPERATION WITH UNDERDEVELOPED COUNTRIES

Philip C Newman, John E Ullamn and Robert S Aries
Chemonomics, Inc
400 Madison Ave, New York 17, N Y
$5.00; 97 pages

In this book, the Aries organization considers the problem of technical co-operation with underdeveloped countries, a subject which has received increasing thought since World War II and particularly since announcement of the Point Four program.

While doubt can be thrown upon most statistics, the authors in the initial chapter stating the problem marshall some truly thought-provoking tables. While the average American enjoys a life expectancy at birth of 64 years and a daily food intake of 3098 calories per day, over 20 percent greater than that estimated as the minimum nutritional standard for maintaining health and normal activity, the average Indian has a life expectancy at birth of only 27 years and a daily food

intake of 1620 calories, 36 percent below the estimated minimum. Here is perhaps the crux of the problem, the haves and the have-nots. What can be done to raise the standard of living of the have-nots?

While offering no great hopes of rapid improvement, the authors suggest that the first goal in underdeveloped areas must be the rehabilitation of agriculture; increased productivity freeing more workers for industry. Industrial development must be geared to the actual requirements of a country and not follow some Western pattern which bears no relation to the country's needs. Following an interesting chapter of case histories in industrial development—Brazil, Mexico, Chile, Puerto Rico and Southeast Asia, the organization of technical assistance by international and private sources is taken up.

This thought-provoking book is a must for any executive considering installation of a foreign plant or subsidiary.

THE PHYSICAL CHEMISTRY OF SURFACE FILMS

W D Harkins
Reinhold Publishing Co
330 West 42nd St, New York, N Y (1952)
$10.00; xvi and 413 pages

This book by the late W D Harkins serves to emphasize the debt chemists and colloid chemists in particular owe him for his pioneering work in surface chemistry. With the exception of the last chapter, "The Role of the Electric Double Layer in the Behavior of Colloids," written by E J W Verwey, the fields discussed are all those in which Professor Harkins had himself been active. This makes the book unusually authoritative. Chapter headings in addition to that already mentioned are:—

The Nature and Energetics of Surfaces
Films on Liquids
Films on Solids
Properties of Soap Solutions
Mechanism of Emulsion Polymerization

The chapter dealing with the fundamental physical chemistry of soaps particularly is likely to stimulate the textile chemist, including as it does a consideration of solubilization. The active application of the principals of solubilization should be helped greatly by a thorough understanding of the basic theory. The material presented on the mechanism of emulsion polymerization is less likely to be of direct interest to the textile chemist as is the beautifully written chapter on surface films.

This book is recommended for any chemist interested in soaps, detergents or colloid chemistry generally.

101 FABRICS

J J Pizzuto and P L D'Allessandro
Textile Press
190 Cedar St, New York, N Y (1952)

This book contains the weave pattern, fabric analysis, and mounted samples of 101 different textile fabrics.

The collection is a good selection of the major cotton, viscose rayon, acetate, wool and mixed-fiber fabrics. In addition a few linen, nylon and silk samples are included. Each page contains one sample, the weave pattern and an analysis of the fabric giving the fiber content, width, finished weight, yarns per inch, yarn number, yarn twist and tensile strength. Some comments are given on dyeing and finishing, but these are rather scanty.

The second section of the book devotes 53 pages to a glossary of terms commonly used in the textile industry. The definitions, brief and as nontechnical as possible, will be helpful to an inexperienced person. Experienced persons, however, will find many terms inadequately covered and in some cases technically inaccurate.

It is the reviewer's opinion that a very useful book has been produced by the authors. It should be a valuable reference volume for any laboratory or business dealing with textile fabrics and an excellent textbook for anyone studying or familiarizing himself with current fabrics.—RJP

GENERAL CHEMISTRY 6th Edition

H G Deming
John Wiley & Sons, Inc
New York, N Y
xi and 656 pages; 195 figures

The author, who has taught chemistry for more than thirty years, has written a readable and extensive text. Its contents are intended for those who are interested in the practical applications of chemistry; yet a nice balance is maintained between the fundamentals of chemistry and their applications.

The usual material is covered in the early part of the text. Such elementary topics as Mixtures and Substances, Atoms and Molecules, Properties of Gases, Solutions, and Derivations of Formulas, etc are well presented. In the latter part of the text, Chapters 37 to 42, emphasis is put upon industrial applications of chemistry.

Material on Organic Chemistry is also briefly presented. Of interest to the textile worker is the presentation in Chapter 35 of Cellulose Products and Plastics.

There are many questions at the end of each chapter that are thought-provoking. Some of the more difficult are aimed at the more earnest student. Often, in the earlier part of the book, the author does not wait to ask questions until the end of the chapter but inserts questions with answers whenever needed—an excellent device to stimulate the beginner in chemistry. The lack of references at the end of each chapter is a serious handicap to those serious students who may wish to investigate a topic more fully.

The diagrams, photographs and charts are very clear and worthwhile. Only one photograph was confusing to the reviewer. On page 119, in attempting to make vivid the molar volume, 22.4 liters, the author uses a photograph of a football perched upon a block representing this volume. The relationship of the pigskin to the molar volume is far from obvious.

On the whole this reviewer found the book to be excellent and one to be recommended to those interested in the main outlines of chemistry and their industrial uses.—VL

MANUAL ON INDUSTRIAL WATER
ASTM Special Technical Bulletin No. 148

ASTM Committee D-19 on Industrial Water
R C Adams, Chairman
American Society for Testing Materials
1916 Race St, Philadelphia, Pa (1953)
336 pages

The need for a manual on industrial water to amplify standard testing methods was recognized by the ASTM prior to World War II. A section of Committee D-19 undertook the task of compiling and editing this excellent reference book in 1946. The individual drafts on specific sections were modified, correlated, and assembled by the entire section of ten competent authorities. The result is a compact, well-integrated text rather than a compilation of different authorships.

The first two chapters are general, covering the industrial uses of water and the difficulties encountered. Chapter III provides a transition to the more technical portion of the manual, defining the terms used and introducing the technologist's conception of water and water deposits. Chapter IV covers the various physical, chemical, and combined treatments that may be employed for different purposes. Chapters V to VIII provide the procedures and precautions to be observed in sampling, analysis, and examination of water, water-formed deposits, and the reaction and corrosion products of water. The Appendix includes a complete list of industrial water standards and methods adopted by the ASTM as well as an excellent glossary of terms. Additionally, the book contains numerous illustrations, charts, graphs, and standard report forms.

The *Manual on Industrial Water* does not replace an adequate library on the subject, but does fulfill the objective of supplying a good reference source of information. This well-correlated and up-to-date information should be extremely useful to the following: executives and plant designers; individuals engaged in industrial operations involving the use of water; and analysts, operators of special instruments, engineers, consultants, and college chemistry students.—EPJ

DETERGENTS—WHAT THEY ARE AND WHAT THEY DO

Donald Price
Chemical Publishing Co, Inc
212 Fifth Ave, New York, N Y (1952)
$4.00; 152 pages

During the past fifteen years the author of this compact book has been actively associated with the rapid development and application of surface-active agents as household and industrial detergents. His active participation, both theoretical and practical, in this field of specialized organic chemistry has been so extensive that this book might well have been another ponderous text for chemists and chemistry students.

However, in the course of his technical work, Dr Price has been asked to present talks on wetting agents and detergents to audiences with nontechnical backgrounds whose knowledge of the complexities of chemistry was decidedly limited. In this book his aim is to tell the story of the development and application of detergents in a language that the nontechnical reader can understand.

The book actually contains a wealth of technical knowledge, so skillfully written and blended with historical development that the complex subject of surface-active agents becomes an interestingly woven story. It is highly recommended, not only for salesmen, purchasing agents, industrial users of detergents, and housewives, but also for chemists and chemistry students.—EPJ.

CHEMICAL ANALYSIS OF INDUSTRIAL SOLVENTS

Morris B Jacobs and Leopold Scheflan
Interscience Publishers, Inc
250 Fifth Ave, New York, N Y (1953)
$10.00; 487 pages

This book is the seventh volume in a series of monographs on analytical chemistry and its applications.

The utilization of solvents in industry has grown so rapidly that it has generated great activity in the development of methods for the assay, detection, and estimation of individual solvents and of solvent mixtures. The authors have given complete coverage of the field in this excellent compilation of standard methods of solvent analysis.

The book contains a wealth of information from all available sources and is well correlated throughout. Reference is made to ACS, USP, ASTM, IP, and Federal Government requirements and specifications for certain solvents. Additionally, it is replete with useful tables, graphs, and illustrations for easy reference and use.

It is impractical to emphasize particular sections of this book because of the tremendous coverage of the subject. As a reference book it should become an indispensable guide not only for the chemist but also for the many industrial users of solvents.—EPJ.

CELLULOSE—THE CHEMICAL THAT GROWS

Williams Haynes
Doubleday and Company, Inc
Garden City, N Y (1953)

This book tells a delightful, informative and fast-moving story of cellulose.

A cellulose chronology precedes the first chapter and the final chapter is followed by a cellulose glossary and seventeen useful appendices, including a 1950 summary of synthetic and semisynthetic fibers.

Although the book was written for the layman, both scientist and nonscientist will find it entertaining and instructive.—HB.

CONDUCTIMETRIC ANALYSIS AT RADIO FREQUENCY

G G Blake
Chemical Publishing Co
212 Fifth Ave, New York, N Y (1952)
$2.75; xviii and 109 pages

This remarkable little book is more a discussion of the many uses to which the author's so-called "zero-shunt" technique may be put than a book on conductimetric analysis. It is interestingly written and thought stimulating. The author describes, in addition to the technique mentioned in the title, use of the device for measurement of diffusion, for automatic control of liquid flow, detection of hypo in photographic work, audio control of relays, study of chemical kinetics, plant nutrition studies, moisture determination, and several other applications.

The book is entirely practical, theoretical considerations being almost completely absent. Some of the apparatus would be difficult for American scientists to duplicate due to the use of British vacuum tube designations.

The ingenuity of the author is remarkable and any laboratory worker who likes to build his own apparatus will certainly find much of interest. All research workers would do well to read it through; it bristles with ideas.—WGC.

FUNDAMENTAL PRINCIPLES OF POLYMERIZATION—— RUBBERS, PLASTICS AND FIBERS

G F D'Alelio
John Wiley and Sons, Inc
New York, N Y (1952)
$10.00; x and 517 pages

Dr D'Alelio's purpose in writing this book is to summarize "the minimum fundamental knowledge that a scientist in the field of polymers should have". The text, therefore, is oriented toward the scientist rather than the practical investigator of polymers.

The first chapter is concerned with Polymers—Rubbers, Plastics, and Fibers, and gives an excellent insight into the causes of the existence of these three states. The rest of the text is concerned with the fundamental aspects of polymers, and such topics as Polymerization Reactions and Functionality, The Existence of Macromolecules, Molecular Weight Determinations, Kinetics of Polymerization, etc are discussed with numerous references to the original literature. Such a large number of references is one of the more valuable features of this book for the scientist, but not of particular value to the person interested in a general understanding of the field.

The text is attractive in design, and the press work is good. Several elementary errors were noted in the typography which seemed to indicate a hurried job of proofreading. The style of the author leaves much to be desired, especially in the over-use of the words "this" and "these," and the phrase "these methods." In spite of these minor shortcomings the work is one than can be read wtih profit by those who are interested in polymeric materials.—VL.

HANDBOOK OF CHEMISTRY 8th Edition

Norbert Adolph Lange (assisted by Gordon M Forker)
Handbook Publishers, Inc
Sandusky, Ohio (1952)
Fabricoid $7.00; xvi and 1998 pages
5 3/8 x 7 3/4

Lange's Handbook is an excellent and comprehensive work that any worker in

the basic sciences and their off-shoots would find indispensable. Of special interest to the textile worker, in addition to the general material concerned primarily with the sciences of physics and chemistry, are the tables on Hygrometry; Constants of Fats, Oils and Waxes; Thermoplastic Materials; and Common Hazardous Chemicals.

The book is highly extensive in scope and yet compact in form. It provides a detailed coverage of Life and Fire Hazards, Elements, Minerals, Inorganic Compounds, Organic Compounds, Industrial Materials, Analysis, and has Miscellaneous Tables of Specific Properties.

This reviewer has had frequent occasion to use the handbook and has found it to be more than adequate. It is a true treasure house of information often needed badly by the worker in applied science.

The typography and the press work are good. Although of minor interest, it has been noticed that the paper used in the previous edition turned yellow within a year or so, thus detracting from its physical appearance however, this defect may not be present in this edition, and in any case should hardly influence its purchase.—VL

THE BRITISH WOOL MANUAL

Published in association with *Textile Recorder* Harlequin Press (1952)

This manual is divided into nine sections, five of which should be of interest to the textile chemist; namely, Composition and Properties of Wool Fibres, The Dyeing of Wool, The Dyeing of Wool Unions, The Finishing of Woolen and Worsted Fabrics, and the Preservation of Animal Fibers against Insect Pests.

Each section gives a good overall picture of its particular field. Specifically in the case of dyeing, the various types of dyes which can be applied to wool are listed according to their chemical constitution, including the structural formulas of the most important dyes. The methods of application of the important classes of dyes are given and modern theories of the acid dyeing of wool and chrome mordanting are discussed.

Considering the manual as a whole, it can be said to cover the woolen field in its nine well-organized sections broadly and yet extensively enough to warrant use as a handbook or reference. There are thirty-two plates in the book as well as diagrams, tables, graphs, and bibliographies.—HB

NEWS

• Avisco to Merchandise Avcoset Program

American Viscose Corporation is taking its Avcoset program for quality control of washable rayon fabrics to the consumer this fall with national advertising and publicity campaigns and a complete merchandising program.

The entire promotion will be geared toward assuring the consumer that fabrics and garments carrying the Avcoset label are permanently washable for the life of the fabric, i e, they will not shrink more than two per cent.

The stabilization process using Avcoset WS (water soluble) is applicable to fabrics containing viscose rayon alone or in blends with other fibers. It is said to eliminate progressive shrinkage and at the same time slow down the natural process of wearing out. It is claimed that fabrics treated with this cellulose ether formula are more lasting than the untreated fabrics, and further, that they are not damaged by chlorine when washed with normal laundry chlorine bleaches. Tests have included washings according to the regular shirting formula and also multiple washings at the boil, for a total of more than fifty washings.

Any processor of rayon fabrics may use Avcoset but only under license. The license is free, but the licensing agreement requires the licensee to apply the finish properly and in accordance with requirements established by American Viscose Corporation. Before any license is signed the finisher involved must demonstrate that he can apply the process properly to meet the Avcoset standards. Sixteen converters of rayon fabrics and 11 dyers and finishers have been licensed so far.

• Felt Standard Sample File

An exposition of standard samples filed by manufacturing members of the Felt Association is now open to the public at the Association's offices, 74 Trinity Place, New York 6, N Y. The samples cover the specifications of the Felt Association, the U S Dept of Commerce CS 185-53, SAE, ASTM, ASME and the military specifications of the Army, Navy and Air Force.

In the mechanical roll felt classification the five standard densities are set up so as to reveal the differences in physical and chemical characteristics. They include the trade designations known as: Laundry, Backcheck, Ball-bearing, Firm Pad and Extra Firm Pad, Lining, Soft Pad. The samples mounted on cards measure 5" x 9⅛", a technical size, making its convenient to check the weight on a gram scale for direct conversion to ounces per square yard.

The file is to be augmented from time to time with samples of types and colors used by the apparel and decorative trades in accordance with current fashions.

• Catalin Adds to Textile Chemical Line

A wide range of anionic, cationic and nonionic softeners, as well as antistatic resins, has been added to the textile chemical line of Catalin Corporation of America, New York.

In conjunction with the addition of these products Catalin has increased laboratory personnel and installed complete facilities for testing and evaluating treated materials.

• Norwegian Textile Group to Tour U S

Plans are in the making for the Norsk Textil Teknisk Forbund (Norwegian Textile Technical Association) to tour this country next Spring, according to Kristofferson, NTTF secretary.

Primary attraction of the visit will be the American Textile Machinery Exhibition at Atlantic City, N J, in April, but members will also see actual mill operations on cotton and woolens systems and visit dyeing and finishing plants as well as hosiery manufacturing centers.

• National Aniline Expands Atlanta Sales Offices

In an effort to accelerate technical and sales service to customers in the Southeast, National Aniline Division, Allied Chemical & Dye Corporation now occupies quarters in a new building at 1216 Spring Street, NW, Atlanta, Georgia. John Boykin, previously resident representative in Atlanta, has been named branch manager.

National's new facilities at Atlanta include a fully-staffed Application Laboratory. Local warehouse stocks are also maintained. With this expansion National Aniline now serves the South through a network of seven offices at Richmond, Greensboro, Charlotte, Columbus, Ga, Atlanta, Chattanooga and New Orleans.

• Quebec Section, CATCC Sponsoring Textile Courses

A series of textiles courses is scheduled for the winter months at Sir George Williams College, Montreal, Canada, under the auspices of the Quebec Section, Canadian Association of Textile Colourists and Chemists.

This year courses in Textiles 101 and 102 will be presented. Textiles 101 is the preliminary course of a three-year program, and covers properties of various fibers, and the preparation of yarns and fabrics and the bleaching thereof. Textiles 102 is a second-year course which covers the properties of various classes of dyestuffs and their application to textile fibers. Textiles 103, given every alternate year, deals with printing and finishing, and will be given next year.

These classes are open to anyone, but an elementary knowledge of chemistry is desirable. The main purpose of the classes is to familiarize young people in the textiles industry with the methods used to *bleach, dye, finish,* and *print* all commercial textile fibers. In order to familiarize the student with materials he may be called upon to use, a short resume is given on the manufacture of man-made fibers and the spinning and weaving of yarns.

Combined lecture and laboratory classes are given two nights a week and are open to male and female students. Registrations is made through The Registrar of the College.

Upon completion of the three-year night school course, a certificate is awarded to each successful student. Prizes are given each year to leading students. Tuition fee is the same as for similar courses at Sir George Williams.

• Houghton Plans Expansion of Research Facilities

Plans for an expanded research program, including a further addition to its laboratories, have been approved by the Board of Directors of E F Houghton & Co, Philadelphia.

Another floor will be added to the present Research Lab, and the staff of chemists will be increased, it is learned. One of the features of the expansion program will be additional emphasis on textile oils and synthetic processing agents for the new man-made fibers.

Construction will begin this Fall, with the hope of initiating the new program early in 1954. Houghton's present laboratory was built in 1928 and an addition constructed in 1941.

• Three NID Staff Members to Head Program at Management Conferences

Three staff members from the headquarters of the National Institute of Drycleaning at Silver Spring, Md, will conduct the lectures and lead discussions in two management conferences to be held in November for owners and managers of California drycleaning plants. The first session of the meetings, which will be sponsored by the California Drycleaners Association, will be in San Francisco, Nov 14-15, and the second session, the following week in Los Angeles.

NID speakers will include William B White, James B Dalgliesh and Don Peters.

Mr White, director of NID training activities, will discuss the general subject of cost control, going into the subtopics of accounting statements, cost comparisons, budgeting and break-even charts.

Mr Peters will handle the subject of production management, discussing methods, analysis, plant layout, wage incentives and lot system production control.

Mr Dalgliesh, who has charge of the Management Course at Silver Spring, will speak on supervision. His subtopics will include selection of employees, employer training, supervising employees and management responsibilities.

• Prices for Carbowax Polyethylene Glycols Lowered

New, lower prices for the nine grades of Carbowax polyethylene glycols have been announced by Carbide and Carbon Chemicals Company, a Division of Union Carbide and Carbon Corporation. The grades affected are the liquids 200, 300, 400 and 600 and the solids 1000, 15000, 1540, 4000 and 6000.

• Burmil-Permachem Agreement

Burlington Mills Corporation has entered into an agreement with the Permachem Corporation, New York, for the use of the latter's germ-free process of treating textiles, according to an announcement made earlier this month by Cecil P Young, Permachem president.

Permachem is a patented product and process, which when applied to textiles and other materials, reputedly imparts permanent self-sterilizing properties for the ordinary useful life of the article. Tests made by independent laboratories are said to indicate that material treated by Permachem kill or inhibit a wide range of disease-producing bacteria, fungi, and molds.

Permachem chemists and technical engineers are already working with Burlington technicians in order to determine from experimental tests whether the process can be adapted to high-speed production methods. Textiles treated in the laboratory thus far show that the process does not appreciably change the hand, color, or strength of the materials, it is reported. It is odorless and reportedly nontoxic to human beings.

• Increased Dextran Production Planned by R K Laros Co

The production of industrial derivatives (derived from cane sugar) by the Chemical Division of R K Laros Co, Bethlehem, Pa, will be greatly increased during the next few months, it is learned.

R W Strohmeier, Chemical Division head, attributes the increase chiefly to the demand for Plavolex, a refined dextran used as a blood plasma volume expander. Dextran is now being used extensively by the Defense Department in place of human plasma, it is reported, because it is free from the virus hepatitis often found in mass-produced plasma.

Mr Strohmeier points out that dextrans having a molecular structure too large for surgical use have many useful applications in several industries, including textiles.

• Cyanamid Experimenting with New Form of Methylstyrene

A new form of methylstyrene from which plastics and resins of high heat resistance can be made is now being produced in experimental quantities by American Cyanamid Company in a pilot plant at their research laboratories in Stamford, Connecticut.

• 25th Anniversary Celebration, ACCCE

The Association of Consulting Chemists and Chemical Engineers, Inc will celebrate their twenty-fifth anniversary on Tuesday, October 27th at the Belmont Plaza Hotel, New York, N Y.

The program will include a banquet, dance and dinner music, and entertainment.

• National Aniline to Produce, Market Adipic Acid

The National Aniline Division, Allied Chemical & Dye Corporation has announced plans for the construction of facilities for the production of adipic acid by a process particularly adapted for operation in conjunction with its large caprolactum plant now under construction at Hopewell, Virginia. National Aniline will also market the chemical.

• Universal Detergents Names Two New Sales Agencies

Universal Detergents, Inc, Long Beach, Calif, has appointed two new sales agencies to handle their line of alkyl aryl sulfonates and aromatic hydrocarbon solvents.

Donald McKay Smith, Inc, 830 Hanna Bldg, Cleveland 15, O, and Emmet D Griffin, Jr, 916 Jones Law Bldg, Pittsburgh 19, Pa, became representatives effective August 15.

NAMES IN THE NEWS

ERNEST K HUNT, manager of advertising and public relations of American Cyanamid Company's Calco Chemical Division, manager of Household Products Department and of the Packaging Development Section, will assume, in addition to his other duties, direction of advertising and sales promotion for the Textile Resin Department. CLEM W KOHLMAN, who previously held the latter post, takes charge of advertising and sales promotion for the six departments in the Industrial Chemicals Division — Paper Chemicals, Refinery Chemicals, Manufacturers Chemicals, Heavy Chemicals, Leather and Miscellaneous Chemicals. A M ASHERMAN will be assistant advertising manager of the Industrial Chemicals Division.

Reporting directly to Mr Hunt will be R L GREASON, who has been named advertising and sales promotion manager of the Textile Resin Department.

Mr Hunt was for many years identified with the paper industry. He was formerly sales manager, Veldown Division, International Paper Company. In 1943 he became advertising manager for Calco and manager of Household Products Department.

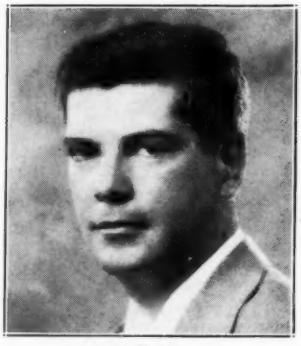
* * *

Other news from Cyanamid concerns the appointment of ROY C WILLIAMS as manager of their industrial chemicals plant in Joliet, Illinois, and the addition of MAURICE P BELLIS to the New Products Development Department.

Mr Williams has been with Cyanamid since 1936. In 1952 he was named assistant superintendent of the Prussiate of Soda Department at Warners, N J.

Dr Bellis came to Cyanamid in 1951. In his new post, he will introduce new Cyanamid products to the chemical industry and will be concerned with general development problems within the Company.

E K Hunt



C W Kohlman

R L Greason

G O MITCHELL was appointed chief colorist of the Dyestuffs Division of Imperial Chemical Industries Ltd on September 1, in succession to G S WHITE, who recently became Division director in charge of Technical Service Departments.

A J WHITFORD, president of the First Natonal Bank of Marinette, has been elected chairman of the board of Ansul Chemical Company, Marinette, Wisconsin. He succeeds HARVEY V HIGLEY, who recently was appointed by President Eisenhower to serve as Director of the Veterans Administration. Mr Higley will continue to serve Ansul as a director, without salary.

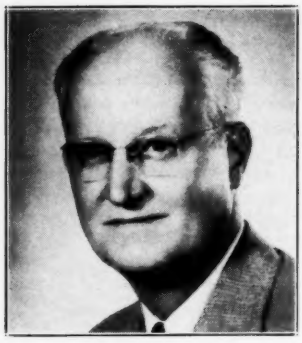
T EDWARD GAVIN, former assistant manager of the Industrial Department, B T Babbitt, Inc, has joined Gallowhur Chemical Corporation, New York, as sales manager. Mr Gavin will direct the sales of Gallowhur's fungicides, herbicides, emulsifiers, quaternary ammonium compounds, detergents and pharmaceuticals.

WARREN R ROSS has been named traffic manager of all divisions of Geigy Company, Inc, New York, N Y. He assumed his new duties on August 31.

FRANK B RIDGWAY, assistant general manager of Du Pont's Textile Fibers Department, in charge of production of all the company's man-made fibers, retired on August 31.

Mr Ridgway joined the company in 1915 as a supervisor of acid production at the Hopewell, Va, explosives plant. He entered rayon production in 1923 and was a key figure in guiding Du Pont's production of rayon from the initial "artificial silk" to the high-quality product of today.

R W Van Tuyle



I Royce

W W Smith

AT a recent meeting of the Board of Directors of Emery Industries, Inc, R W Van TUYLE was elected a director, and named to the newly established post of vice-president in charge of manufacturing.

Mr. Van Tuyle has been associated with Emery for 19 years. During most of that period he was research director. In 1949, he became chemical director, in charge of all research, control, chemical engineering and experimental development activities.

In his new capacity, he adds the responsibility for supervising all chemical manufacturing operations, including the new ozone-oxidation plant recently announced by Emery.

R S DICKS has been appointed manager of the Chemical Process Engineering section of the Textile Division of Celanese Corporation of America. In his new capacity, Dr Dicks will supervise economic studies for new processes and plant improvements as they relate to chemical operations of the corporation's textile plants.

Dr Dicks, formerly senior process engineer for the Shell Oil Company in New York, joined Celanese in April, 1953.

J P BAUER has retired after nearly 35 years of service with Ciba Company, Inc and its predecessors. Mr Bauer served in various executive capacities with the company and was elected a vice-president in January, 1946. His lengthy service with Ciba was devoted almost entirely to the technical side of the business, and in his capacity as manager of the Technical Service Division he was a prominent figure in the American dyestuff industry.

STUART BONE has been named West Coast representative for Central Yarn and Dyeing Company. He will cover the area west of the Rockies.

IRVING ROYCE, Southern representative for the Royce Chemical Company, has completed his twentieth year of service in the Southern territory. His headquarters are at 2139 Dowd Rd, Charlotte, N C.

Mr Royce started with the company in 1931 as a supervisor in the producton of sodium hydrosulfite and later was transferred to the Sales Department where he received initial sales training. In 1933 he was assigned to the Southern territory and has served this region ever since. He is a member of the Piedmont Section, AATCC.

HARRY M MARTIN, who formerly represented Enterprise Dye Works as a sales representative, has joined the sales staff of the Woonsocket Color & Chemical Company. Prior to his association with Enterprise Mr Martin was a dyer with Peerless Woolen Mills, sales technician with Kennedy and Britt and occupied the same position with Sidney Blumenthal & Company. He has been associated with the textile industry for the past thirty years and will represent Woonsocket as Southern New England sales representative covering Connecticut, part of Rhode Island and part of Massachusetts.

IN a move to centralize the special activities of the President's office at Lowell Tech, JAMES A McLEAN has been appointed as professor and co-ordinator of special services.

Mr McLean comes to Lowell from Burlington Mills Corporation, where he held the position of assistant to the merchandising vice-president.

WALDO W SMITH succeeds the late HOWARD R CHASE as general manager of Tower Iron Works, Providence, R I, manufacturers of textile equipment.

Mr Smith has been connected with TIW since 1939, and has served as chief engineer since 1947.

IN the second phase of its sales expansion program, Organic Chemicals Division of Dewey and Almy Chemical Company has appointed THOMAS C TARBOX to head its sales force in the Mid-Atlantic states area.

Mr Tarbox, who will work out of New York, will handle sales of all Darex organic chemicals. His appointment follows that of JOHN BROUGHTON, recetnly promoted to handle sales in the Chicago-Midwest territory.

Mr Tarbox joins Dewey and Almy from Esso Standard Oil Company where he worked with lubricants and fuels.

MDEAN FULLERTON has been appointed New England District Sales Manager for the Chemical Division of Koppers Company, Inc.

Mr Fullerton, with Koppers since 1942, was formerly supervisor, Division sales office. He replaces J W LaBelle, who has resigned.

NEW PRODUCTS

• Glyco Begins Full-Scale Production of "Tetrines"

Full-scale production of ethylenediamine tetraacetic acid (EDTA) and its salts, a series of products of special value in the containment of trace metal impurities, has been undertaken by Glyco Products Co, Inc at their plant in Williamsport, Pa. The products are being produced in tonnage quantities under the trademark "Tetrine."

In conjunction with dyeing, a small percentage of Tetrine is said to produce brighter, cleaner, more uniform shades with an actual over-all economy. The Tetrines are reported to be exceptionally stable, functioning efficiently in highly acid, neutral or strongly alkaline solutions to complex or sequester the trace metal impurity so that it is rendered harmless under processing conditions.